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ATTACHMENT 5 TO APPENDIX A TO PART 60--

Figure 2 -- Sample Qualification Test Guide Cover Page

INFORMATION

SPONSOR NAME	
SPONSOR ADDRESS	
FAA QUALIFICATION TEST GUIDE	
(SPECIFIC AIRPLANE MODEL)	
<i>for example</i>	
Stratos BA797-320A	
(Type of Simulator)	
(Simulator Identification Including Manufacturer, Serial Number, Visual System Used)	
(Simulator Level)	
(Qualification Performance Standard Used)	
(Simulator Location)	
FAA Initial Evaluation	
Date: _____	
_____	Date: _____
(Sponsor)	
_____	Date: _____
Manager, National	
Simulator Program, FAA	

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Figure 3 – Sample Simulator Information Page

INFORMATION

SPONSOR NAME	
SPONSOR SIMULATOR CODE:	BA-797 #1
AIRPLANE MODEL:	Stratos BA797-320A
AERODYNAMIC DATA REVISION:	BA797-320, CPX-8D, January 1988
ENGINE MODEL(S) AND REVISION:	CPX-8D; RPT-6, January 1988 DRQ-4002, RPT-3, April 1991
FLIGHT CONTROLS DATA REVISION:	BA707-320; May 1988
FLIGHT MANAGEMENT SYSTEM:	Berry XP
SIMULATOR MODEL AND MANUFACTURER:	MTD-797, Tinker Simulators, Inc.
DATE OF SIMULATOR MANUFACTURE:	1988
SIMULATOR COMPUTER:	CIA
VISUAL SYSTEM MODEL, MANUFACTURER, and DISPLAY TYPE:	ClearView, Inc. "Real World T2;" 5 Channel, 6-window CRT display
VISUAL SYSTEM COMPUTER:	LMB-6
MOTION SYSTEM:	Tinker 6 DOF

Information on this page must be updated and kept current with any modifications or changes made to the simulator and reflected on the log of revisions and the list of effective pages.

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Figure 4 – Sample Statement of Qualification

INFORMATION

(subject to change)

Federal Aviation Administration
National Simulator Program



**Statement
of
Qualification**

This is to certify that representatives of the
National Simulator Program
Completed an evaluation of the

**Go-Fast Training Center
Stratos BA-797 Flight Simulator**
FAA Identification Number 701

And found it to meet the standards set forth
In the Qualification Performance Standards
For a simulator at
Level C

(date)

for the NSPM

Subject to the attached
Configuration List and Restrictions

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Figure 4A – Sample Statement of Qualification; Configuration List

INFORMATION

STATEMENT of QUALIFICATION
CONFIGURATION LIST

Go-Fast Training Center Stratos BA-797-232 -- Level C -- FAA ID# 701

Configuration		Date Qualified
Airplane Model:.....	BA-797-232.....	July 12, 1988
Re-configurable to:.....	BA-797-287 (see FAA ID#722)	
Engine Model(s) and Revision:...	<input type="checkbox"/> CPX-8D, RPT-6.....	July 12, 1988
	<input type="checkbox"/> DRQ-4002, RPT-3.....	April 1, 1991
Flight Management System:.....	Berry XP.....	July 12, 1988
Visual System / Manufacturer:	Real World T2, Clear View, Inc.	
<input type="checkbox"/> CRT Installation:.....	5 Channel, 6 Window.....	July 12, 1988
<input type="checkbox"/> Projected System:.....	° Horizontal Viewing Angle.....	
Flight Instruments:		
<input type="checkbox"/> Electro-Mechanical:.....		July 12, 1988
<input type="checkbox"/> Display (CRT, LCD, etc.).....		
<input type="checkbox"/> Combination		
<input type="checkbox"/> Heads-Up Display.....	Jones Industries.....	December 1, 1993
Flight Director:		
<input type="checkbox"/> Single Cue.....		
<input type="checkbox"/> Dual Cue.....	Sperry.....	July 12, 1988
<input type="checkbox"/> None.....		
Engine Instruments:		
<input type="checkbox"/> Electro-Mechanical.....		July 12, 1988
<input type="checkbox"/> Display (CRT, LCD, etc.).....		
<input type="checkbox"/> Combination.....		
Navigation Type(s):		
<input type="checkbox"/> ADF.....		July 12, 1988
<input type="checkbox"/> VOR/ILS.....		July 12, 1988
<input type="checkbox"/> GPS.....		
<input type="checkbox"/> INS.....		October 10, 1991
<input type="checkbox"/> IRS.....		
Weather Radar:	Jones Industries, Inc.	August 3, 1996
Windshear Equipment		
TCAS		
ACARS		

(Continue as Necessary)

What is document FAA-S-120-40C? How do we access it?

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Figure 4B – Sample Statement of Qualification; Qualified/Non-Qualified Tasks

INFORMATION

STATEMENT of QUALIFICATION
Qualified/Non-Qualified Tasks
Go-Fast Training Center
Stratos BA-797 -- Level C -- FAA ID# 701

The following are those items listed in the Airplane Flight Simulator Qualification Performance Standards (QPS), FAA-S-120-40C, dated (May 1, 2000) Appendix 3, Subjective Tests, indicating what tasks and systems are qualified (Q) and what tasks and systems are not qualified (NQ).

NQ	Q	TASK	NQ	Q	TASK
		A. Preparation for Flight.			2. Abnormal/Emergency.
	X	Preflight.		X	(a) Rejected, with brake fade
		B. Surface Ops (Pre-Takeoff).	X		(b) Rejected, special perf.
		1. Engine start.			(c) Propulsion system malfunction.
	X	(a) Normal start.		X	(i) prior to V ₁
	X	(b) Alternate start operations.		X	(ii) between V ₁ and V _R
	X	(c) Abnormal starts		X	(iii) between V _R and 500' AGL
	X	2. Pushback.	X		(d) Flight control system failure.
X		3. Powerback.		X	(e) Other.
		4. Taxi			D. In-flight Operation.
	X	(a) Thrust response.			1. Climb.
	X	(b) Power lever friction.		X	(a) Normal.
	X	(c) Ground handling.		X	(b) One engine inoperative.
	X	(d) Nosewheel scuffing.		X	(c) Other.
	X	(e) Brake operation			2. Cruise.
	X	(f) Ground hazard.		X	(a) Performance (speed vs. power).
X		(g) SMGS		X	(b) Turns w/wo spoilers
	X	(h) Other.		X	(c) High altitude handling.
		C. Takeoff.		X	(d) High airspeed handling
		1. Normal. (Day/Dusk/Night)	X		(e) Mach effects
X		(a) Day		X	(f) Normal and steep turns.
	X	(b) Dusk (or Twilight)	X		(g) Performance turns.
	X	(c) Night			(h) Approach to stalls
	X	(d) Propulsion system checks		X	1) cruise
	X	(e) Airplane acceleration		X	2) takeoff or approach
	X	(f) Nosewheel/rudder steering		X	3) landing
	X	(g) Crosswind (max. demo)			(i) High AOA maneuvers
X		(h) Special performance.	X		1) cruise
	X	(i) Lowest visibility.		X	2) takeoff or approach
	X	(j) Landing gear, flap/slat ops.	X		3) landing
	X	(k) Other.		X	(j) In-flight engine shutdown

Initials _____ Date _____

-- Continued Next Page --

NQ	Q	TASK (Con't.)	NQ	Q	TASK (Con't.)
	X	(k) In-flight engine restart			(ii) ILS Category II
	X	(l) Maneuver w/ engine(s) inop.		X	A. W/Wo Auto-Couple
X		(m) Slow flight.		X	B. Engine inoperative..
X		(n) Spec flight characteristics.			(iii) ILS Category III
X		(o) Manual flight control	X		A. Min./stnby. electrical power.
X		(p) Other flight control failures	X		B. Generator/alternator failure
	X	(q) Holding.	X		C. Tail wind 10 knots
X		(r) Airborne hazard.	X		D. Crosswind 10 knots
X		(s) Ops. in icing conditions	X		E. Rollout.
X		(t) Upset / disturbance recovery	X		F. Engine inoperative.
X		(u) Unusual attitude recovery			(iv). Missed approach
X		(v) TCAS	X		A. All engines operating.
X		(w) Effects of airframe icing.	X		B. One engine inoperative.
X		(x) Other.			(v) PAR
		3. Descent.	X		A. Normal
X		(a) Normal.	X		B. With crosswind.
X		(b) Max. rate and recovery	X		C. With one engine inoperative.
X		(c) Flight control failure	X		D. Missed approach.
X		(d) High sink rate and recovery.			(vi) DGPS
X		(e) Other.	X		A. Normal
		E. Approaches.	X		B. With crosswind.
		1. Instrument Approach	X		C. With one engine inoperative.
		(a) Non-precision:	X		D. Missed approach.
X		(i) NDB			(vi) MLS.
X		(ii) VOR.	X		A. Normal
X		(iii) RNAV.	X		B. With crosswind.
X		(iv) TACAN	X		C. With one engine inoperative.
X		(v) DME Arc	X		D. Missed approach.
X		(vi) LOC/FC.			(vii) Steep Glide Path.
X		(vii) LOC/BC.	X		A. Normal
X		(viii) LDA.	X		B. With crosswind.
X		(ix) SDF	X		C. With one engine inoperative.
X		(x) ASR.	X		D. Missed approach.
X		(xi) GPS.			2. Visual Approach Maneuvers.
X		(xii) With engine inoperative	X		(a) Abnormal wing flaps/slats
X		(xiii) Missed approach.	X		(b) No G/S or visual flightpath aid.
		(b) Precision:	X		(c) Circling Approach.
		(i) ILS Category I			3. Abnormal/emergency.
X		A. Manual w/wo flight director	X		(a) One engine inoperative.
X		B. Max. crosswind	X		(b) Min. electric/hydraulic power.
X		C. Windshear.	X		(c) Pitch trim malfunction.
X		D. Engine inoperative.	X		(d) Jammed horizontal stabilizer.

Initials _____ Date _____

-- Continued Next Page --

NQ	Q	TASK (Con't.)	NQ	Q	TASK (Con't.)
	X	(e) Roll/Yaw trim malfunction.		X	5. Ground hazard.
X		(f) Worst Flt Cont fail. (+CCA).	X		6. SMGS.
X		(g) Other failures / trng. prog.	X		7. Other.
X		(h) LAHSO ops.			J. Any Flight Phase.
	X	(i) Other.	X		1. Air conditioning.
		F. Missed approach.	X		2. Anti-icing/deicing.
	X	1. Manual.	X		3. Auxiliary powerplant.
X		2. Automatic (if applicable).	X		4. Communications.
		G. Visual Segment / Landing.	X		5. Electrical.
		1. Normal	X		6. Fire detection and suppression.
X		(a) Day	X		7. Flaps/Slats.
	X	(b) Dusk (or Twilight)	X		8. Flight cont (+ spoiler/spdbrake).
	X	(c) Night	X		9. Fuel and oil.
	X	(b) From visual traffic pattern.	X		10. Hydraulic.
	X	(c) From NP approach.	X		11. Landing gear.
	X	(d) From precision approach	X		12. Oxygen.
	X	(e) Max. crosswind.	X		13. Pneumatic.
X		(f) From circling approach.	X		14. Propulsion System.
		2. Abnormal/emergency.	X		15. Pressurization.
		(a) With engine(s) inoperative --	X		16. Flt mgmt / guidance systems.
X		(i) 2-eng airpl. one inop.	X		17. Auto landing aids.
X		(ii) 3-eng airpl. wing+ctr. inop.	X		18. Auto-pilot.
	X	(iii) 4-eng airpl. 50%, one side.	X		19. Auto-throttle.
	X	(b) Rejected landing.	X		20. Flight data displays.
	X	(c) Min. elect./hyd. power.	X		21. Flight mgmt computers.
	X	(d) Pitch trim malfunction	X		22. Flight Director.
	X	(e) Jammed horizontal stab.	X		23. Flight Instruments.
	X	(f) Roll/Yaw trim malfunction.	X		24. HUD system.
X		(g) Worst Flt Cont fail. (+CCA).	X		25. Navigation systems.
X		(h) Other failures in trng. prog.	X		26. Weather radar.
X		(i) LAHSO ops.	X		27. Stall warning/avoidance.
	X	(j) Other.	X		28. Stability augmentation.
		H. Windshear.	X		29. ACARS.
	X	1. Takeoff.	X		30. Other.
	X	2. Climb.			K. Eng. Shutdown and Parking.
	X	3. Approach.	X		1. Systems operation.
		I. Surface Ops (Post Landing).	X		2. Parking brake operation.
	X	1. Landing roll.			
	X	2. Spoiler operation.			
	X	3. Reverse thrust operation.			
	X	4. Wheel brake operation.			

Initials _____ Date _____

-- Continued Next Page --

NQ	Q	SIMULATOR SYSTEM	NQ	Q	SIMULATOR SYSTEM
		A. Inst. Ops. Station (IOS).			B. Sound Controls.
	X	1. Power switch(es).		X	-- On / off / rheostat
		2. Airplane conditions.			C. Motion/Cont. Load. System.
	X	(a) GW, CG, Fuel weight, etc.		X	1. On / off / emergency stop.
	X	(b) Airplane systems status.		X	2. Crosstalk
	X	(c) Ground crew functions		X	3. Smoothness
	X	(d) Other.			D. Observer Stations.
		3. Airports.		X	1. Position.
	X	(a) Number and selection.			
	X	(b) Runway selection.			
	X	(c) Runway surface condition			
	X	(d) Preset positions			
	X	(e) Lighting controls.			
	X	(f) Other.			
		4. Environmental controls.			
	X	(a) Clouds (base and tops).			
	X	(b) Visibility			
	X	(c) Runway visual range			
	X	(d) Temperature.			
	X	(e) Climate conditions			
	X	(f) Wind speed and direction.			
X		(g) Windshear.			
	X	(h) Other.			
		5. Airplane system malfunctions.			
	X	(a) Insertion / deletion.			
	X	(b) Problem clear.			
	X	(c) Other			
		6. Locks, freezes, repositioning.			
	X	(a) Problem freeze / release.			
	X	(b) Position freeze / release.			
	X	(c) Repositioning			
	X	(d) Ground speed control			
	X	(e) Other			
X		7. Remote IOS.			
	X	8. Other.			

Initials _____ Date _____ -- End --

ATTACHMENT 5 TO APPENDIX A TO PART 60—

Figure 5 – Sample Recurrent Evaluation Requirements Page

INFORMATION

Recurrent Evaluation Requirements <i>Completed at conclusion of Initial Evaluation</i>	
Recurrent Evaluations to be conducted each (fill in) months Allotting _____ hours of FTD time. Signed: _____ NSPM / Evaluation Team Leader	Recurrent evaluations are due as follows: (month) and (month) and (month) (enter or strike out, as appropriate) Date _____
Revision: Based on (enter reasoning): _____ _____	
Recurrent Evaluations are to be conducted each (fill in) months. Allotting _____ hours. Signed: _____ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: (month) and (month) and (month) (enter or strike out, as appropriate) Date _____
Revision: Based on (enter reasoning): _____ _____	
Recurrent Evaluations are to be conducted each (fill in) months. Allotting _____ hours. Signed: _____ NSPM Evaluation Team Leader	Recurrent evaluations are due as follows: (month) and (month) and (month) (enter or strike out, as appropriate) Date _____

(Repeat as Necessary)

ATTACHMENT 6 TO APPENDIX A TO PART 60—

Figure 6 – Sample Request for Initial, Upgrade, or Reinstatement Evaluation Date
INFORMATION

Mr. Edward Cook
Manager, National Simulator Program
Federal Aviation Administration
P.O. Box 20636 (AFS-205)
Atlanta, GA 30320

Dear Mr. Cook:

RE: Request for Initial [Upgrade / Reinstatement] Evaluation Date

This is to advise you of our intent to request an evaluation of our (Aircraft Type/Level) Simulator located in (City/State) at the (Facility) on (proposed evaluation date). [The proposed evaluation date shall not be more than 180 days following the date of this letter.] This simulator [has / has not] been previously qualified by the FAA [and had been issued FAA identification number XXX]. [The history of this simulator is as follows: _____.]

We agree to provide a Qualification Test Guide (QTG) to your staff not later than 45 days prior to the proposed evaluation date (if tests not run at training site, an additional "1/3 on-site" tests must be provided not later than 14 days prior the proposed evaluation date). If we are unable to meet the above date for the evaluation, this may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation.

[Added comments from Operator/Sponsor, if any]

Please contact (Name and Telephone Number of Sponsor's Contact) to confirm the date for this initial evaluation. We understand a member of your National Simulator Program staff will respond to this request within 14 days.

A copy of this letter of intent has been provided to our Principal Operations Inspector (POI) and/or Training Center Program Manager (TCPM).

Sincerely,

(Signature)

Acknowledgement:

____ We concur with your proposed dates.

____ The date requested is not available, however, we propose the following date:

____ Please provide us with the following information:

Scheduler, National Simulator Program

Date

**Attachment 6 to Appendix A to Part 60—
Simulator Qualification Requirements for
Windshear Training Program Use**
1. Applicability

Begin QPS Requirements

This attachment applies to all simulators used to satisfy the training requirements of 14 CFR part 121 that pertain to the sponsor's approved low-altitude windshear flight training program, or the training permitted in accordance with an FAA-approved training program under 14 CFR part 121, 135, or 142, that addresses low-altitude windshear encounters.

End QPS Requirements

2. Statement of Compliance and Capability (SOC)

Begin QPS Requirements

a. The sponsor must submit an SOC that confirms that the aerodynamic model is based on flight test data supplied by the airplane manufacturer, or other approved source, and that any change to environmental wind parameters, including variances in those parameters for windshear conditions, once inserted for computation, result in the correct simulated performance. This

statement must also include examples of where environmental wind parameters are currently evaluated in the simulator (such as crosswind takeoffs, crosswind approaches, and crosswind landings).

b. For those simulators where windshear warning, caution, or guidance hardware was not provided as original equipment, the SOC must also state that the simulation of the added simulator hardware and/or software, including associated cockpit displays and annunciations, function the same or equivalent to the system(s) installed in the airplane and be accompanied by a block diagram that depicts the input and output signal flow, comparing that signal flow to the equipment installed in the airplane being simulated.

End QPS Requirements

3. Models

Begin QPS Requirements

The windshear models installed in the simulator software that will be used for the qualification evaluation must do the following:

a. Provide cues necessary for recognition of the onset of a windshear phenomena and potential performance degradation that

would require a pilot to initiate recovery procedures. The cues must include all of the following, as may be appropriate for the appropriate portion of the flight envelope:

(1) Rapid airspeed change of at least ± 15 knots (kts).

(2) Stagnation of airspeed during the takeoff roll.

(3) Rapid vertical speed change of at least ± 500 feet per minute (fpm).

(4) Rapid pitch change of at least $\pm 5^\circ$.

b. Be adjustable in intensity (or other parameter to achieve an intensity effect) to at least two (2) levels so that upon encountering the windshear the pilot may identify its presence by the cues described above, and that when the pilot applies the recommended procedures for escape from such a windshear:

(1) If the intensity is lesser, the performance capability of the simulated airplane in the windshear permits the pilot to maintain a satisfactory flightpath; and

(2) If the intensity is greater, the performance capability of the simulated airplane in the windshear does not permit

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the pilot to maintain a satisfactory flightpath (crash).

Note: The means used to accomplish the “non-survivable” scenario of paragraph 3.b(2), of this attachment, that involve operational elements of the simulated airplane, must reflect parameters that fall within the dispatch limitations of the airplane.
c. Be available for use in the FAA approved windshear flight training program.

End QPS Requirements

4. Demonstrations

Begin QPS Requirements

a. The sponsor must identify two of the required, survivable training windshear models—one takeoff and one approach. The sponsor must identify the wind components of the two models selected and present this information in graphical format so that all components of the windshear are shown, including initiation point, variance in magnitude, and either time or distance correlation as may be appropriate. The simulator must be operated at the same gross weight, airplane configuration, and initial airspeed in all of the following situations:
(1) Takeoff—through calm air.
(2) Takeoff—through the first selected survivable windshear.
(3) Approach—through calm air.
(4) Approach—through the second selected survivable windshear.
b. In each of these four situations, at an “initiation point” (that point being where the onset of windshear conditions is, or would have been recognized, depending on the test being run), the recommended procedures for windshear recovery are applied, and the results are recorded, as specified in paragraph 5 of this attachment.
c. These recordings are made without the presence of programmed random turbulence. Turbulence that results from the windshear model is to be expected, and no attempt may be made to neutralize turbulence from this source.
d. The definition of the models and the results of the demonstrations of all four (4) cases described in paragraph 4.a of this attachment, must be made a part of the MQTG.

End QPS Requirements

5. Recording Parameters

Begin QPS Requirements

a. In each of the four MQTG cases, an electronic recording (time history) must be made of the following parameters:
(1) Indicated or calibrated airspeed.
(2) Indicated vertical speed.
(3) Pitch attitude.
(4) Indicated or radio altitude.
(5) Angle of attack.
(6) Elevator position.
(7) Engine data (thrust, N_1 , or throttle position).
(8) Wind magnitudes (simple windshear

model assumed).

b. These recordings shall be initiated at least 10 seconds prior to the initiation point and continued until recovery is complete or ground contact is made.

End QPS Requirements

6. Equipment Installation and Operation

Begin QPS Requirements

All windshear warning, caution, or guidance hardware installed in the simulator must operate as it operates in the airplane being simulated. For example: If the simulator encounters a rapidly changing wind speed and/or direction that would have resulted in a windshear warning in the airplane were the same conditions encountered, the simulator must respond equivalently, without instructor/evaluator intervention.

End QPS Requirements

7. Qualification Test Guide

Begin QPS Requirements

a. All QTG material (performance demonstration recordings, etc.) will be forwarded to the NSPM.
b. The simulator will be scheduled for an evaluation in accordance with normal procedures. Use of recurrent evaluation schedules will be used to the maximum extent possible.
c. During the on-site evaluation, the evaluator will ask the operator to run the performance tests and record the results. The results of these on-site tests will be compared to those results previously approved and placed in the QTG or MQTG, as appropriate.
d. QTG's for new (or MQTG's for upgraded) simulators must contain or reference the information described in paragraphs 2, 3, 4, and 5 of this attachment.

End QPS Requirements

8. Subjective Evaluation

Begin Information

The NSPM will fly the simulator in at least two of the available windshear scenarios to examine the function of the simulator and the simulated airplane and to evaluate subjectively the performance of the simulator as it encounters the programmed windshear conditions according to the following:

a. One scenario will include parameters that enable the pilot to maintain a satisfactory flightpath.
b. One scenario will include parameters that will not enable the pilot to maintain a satisfactory flightpath (crash).
c. Other scenarios may be examined at the discretion of the NSPM.

End Information

9. Qualification Basis

Begin Information

3. Related Reading References.
4. Background.
5. Quality Assurance Program.
6. Sponsor Qualification Requirements.
7. Additional Responsibilities of the Sponsor.

The addition of windshear programming to a simulator in order to comply with the qualification for required windshear training does not change the original qualification basis of the simulator.

End Information

10. Demonstration Repeatability

Begin Information

For the purposes of demonstration repeatability, it is recommended that the simulator be flown by means of the simulator's autodriven function (for those simulators that have autodriven capability) during the demonstrations.

End Information

Attachment 7 to Appendix A to Part 60—Record of FSD Directives

Begin QPS Requirements

When the FAA determines that modification of a simulator is necessary for safety reasons, all affected simulators must be modified accordingly, regardless of the original qualification standards applicable to any specific simulator.

a. A copy of the notification to the sponsor from the TPAA or NSPM that a modification is necessary will be filed in and maintained as part of this attachment.
b. The effective FSD Directives, including the date of the directive, the direction to make these changes, and the date of completion of any resulting modification must be maintained in a separate section of the MQTG and indexed accordingly. The MQTG must also be updated to include the information described in § 60.15(b)(4) as may be appropriate as a result of the FSD Directive. See Attachment 5 for a sample Index of Effective FSD Directives.

End QPS Requirements

Appendix B to Part 60—Qualification Performance Standards for Airplane Flight Training Devices

Begin Information

This appendix establishes the standards for Airplane Flight Training Device (FTD) evaluation and qualification at one of the established levels. The Flight Standards Service, National Simulator Program (NSP) staff, under the direction of the NSP Manager (NSPM), is responsible for the development, application, and interpretation of the standards contained within this appendix. The procedures and criteria specified in this document will be used by the NSPM, or a person or persons assigned by the NSPM (e.g., FAA pilots and/or FAA aeronautical engineers, assigned to and trained under the direction of the NSP—referred to as NSP pilots or NSP engineers, other FAA

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personnel, etc.) when conducting airplane FTD evaluations.

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Attachment 1 to Appendix B to Part 60—General FTD Requirements

Attachment 2 to Appendix B to Part 60—Flight Training Device (FTD) Objective Tests

Attachment 3 to Appendix B to Part 60—Flight Training Device (FTD) Subjective Tests

Attachment 4 to Appendix B to Part 60—Definitions and Abbreviations

Attachment 5 to Appendix B to Part 60—Sample Documents

Attachment 6 to Appendix B to Part 60—Record of FSD Directives

1. Introduction

a. This appendix contains background information as well as information that is either directive or guiding in nature. Information considered directive is described in this document in terms such as “will,” “shall,” and “must,” and means that the actions are mandatory. Guidance information is described in terms such as “should,” or “may,” and indicate actions that are desirable, permissive, or not mandatory and provide for flexibility.

b. To assist the reader in determining what areas are directive or required and what areas are guiding or permissive—

(1) The text in this appendix is contained within sections, separated by horizontal lines; headings associated with these horizontal lines will indicate that a particular section begins or ends. All of the text falls into one of three sections: a direct quote or a paraphrasing of the Part 60 rule language; additional requirements that are also regulatory but are found only in this appendix; and advisory or informative material.

(2) The text presented between horizontal lines beginning with the heading “Begin Rule Language” and ending with the heading “End Rule Language,” is a direct quote or is paraphrased from Part 60 of the regulations.

For example: The rule uses the terms “flight simulation device (FSD)” and “aircraft;” however, in this appendix the rule is paraphrased and the term “simulator” is used instead of FSD, and “airplane” is used instead of aircraft. Additionally, the rule uses the terms “this part” and “appropriate QPS;” however, in this appendix the rule is paraphrased and the terms “Part 60” and “this appendix,” respectively, are used instead. (Definitions are not paraphrased or modified in any way.) For ease of referral, the Part 60 reference is noted at the beginning and the end of the bordered area.

(3) The text presented between horizontal lines beginning with the heading “Begin QPS Requirements” and ending with the heading “End QPS Requirements,” is also regulatory but is found only in this appendix.

(4) The text presented between horizontal lines beginning with the heading “Begin Information” and ending with the heading “End Information,” is advisory or informative.

(5) The tables in this appendix have rows across the top of each table—

(a) The data presented in columns under the heading “QPS REQUIREMENTS” is regulatory but is found only in this appendix.

(b) The data presented in columns under the heading “INFORMATION” is advisory or informative.

Important Note: While this appendix contains quotes and paraphrasing directly from the rule, the reader is cautioned *not* to rely solely on this appendix for regulatory requirements regarding flight simulators. For regulatory references for airplane flight simulators, the reader is referred to paragraphs 3.a through h of this appendix.

c. Questions regarding the contents of this publication should be sent to: U.S. Department of Transportation, Federal Aviation Administration, Flight Standards Service, National Simulator Program Staff, AFS-205, PO Box 20636, Atlanta, Georgia 30320. Telephone contact numbers are: Phone, 404-305-6100; fax, 404-305-6118. The National Simulator Program Internet Web site address is: www.faa.gov/nsp. On this Web Site you will find an NSP personnel list with contact information, a list of qualified flight simulation devices, advisory circulars, a description of the qualification process, NSP policy, and an NSP “In-Works” section. Also linked from this site are additional information sources, handbook bulletins, frequently asked questions, a listing and text of the Federal Aviation Regulations, Flight Standards Inspector's handbooks, and other FAA links.

d. The NSPM encourages the use of electronic media for communication and the gathering, storage, presentation, or transmission of any record, report, request, test, or statement required by this **appendix** provided the media used has adequate provision for security and is acceptable to the NSPM. The NSPM recommends inquiries on system compatibility prior to any such activity. Minimum System requirements may

be found on the NSP Website.

End Information

2. Definitions

Begin Information

See attachment 4 of this appendix for a list of definitions and abbreviations. Attachment 4 contains definitions directly quoted from 14 CFR part 1 or part 60, contained within a bordered area with Red-colored left hand columns, indicating they are quoted from 14 CFR part 1 or part 60 and are regulatory. Additional definitions and abbreviations used in reading and understanding this document are contained within bordered areas with Blue-colored left hand columns, indicating they are also regulatory but appear only within this document. For purposes of accuracy, the definitions listed are directly quoted, and are not paraphrased.

End Information

Comment --- There is no mention of color coding in appendix A. If color coding is adopted, it should be consistently applied to all appendices.

3. Related Reading References

Begin Information

- a. 14 CFR part 60
- b. 14 CFR part 61.
- c. 14 CFR part 63.
- d. 14 CFR part 121.
- e. 14 CFR part 125
- f. 14 CFR part 135.
- g. 14 CFR part 141
- h. 14 CFR part 142
- i. Advisory Circular (AC) 120-28C, Criteria for Approval of Category III Landing Weather Minima.
- j. AC 120-29, Criteria for Approving Category I and Category II Landing Minima for part 121 operators.
- k. AC 120-35B, Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training, Line Operational Evaluation.
- l. AC 120-41, Criteria for Operational Approval of Airborne Wind Shear Alerting and Flight Guidance Systems.
- m. AC 120-57A, Surface Movement Guidance and Control System (SMGS).
- n. AC 150/5300-13, Airport Design.
- o. AC 150/5340-1G, Standards for Airport Markings.
- p. AC 150/5340-4C, Installation Details for Runway Centerline Touchdown Zone Lighting Systems.
- q. AC 150/5340-19, Taxiway Centerline Lighting System.
- r. AC 150/5340-24, Runway and Taxiway Edge Lighting System.
- s. AC 150/5345-28D, Precision Approach Path Indicator (PAPI) Systems
- t. International Air Transport Association document, “Flight Simulator Design and Performance Data Requirements, Fifth Edition (1996).

Certification of Part 23 Airplanes.
w. International Civil Aviation Organization (ICAO) Manual of Criteria for the Qualification of Flight Simulators, First Edition, 1994 Doc 9625-AN/938.
x. Airplane Flight Simulator Evaluation Handbook, Volume I (February, 1995) and Volume II (July, 1996), The Royal Aeronautical Society, London, UK.
y. Airplane Flight Simulator Evaluation Handbook, Volume I (February, 1995) and Volume II (July, 1996), The Royal Aeronautical Society, London, UK.
z. FAA Publication FAA-S-8081 series (Practical Test Standards for Airline Transport Pilot Certificate, Type Ratings, Commercial Pilot, and Instrument Ratings).
End Information

4. Background

Begin Information

a. The primary objective of flight training continues to be one of providing a means for flightcrew members to acquire the skills and knowledge necessary to perform to a desired safe standard. By the same measure, flight simulation continues to provide the most effective, viable environment for the instruction, demonstration, and practice of the maneuvers and procedures (called training events) pertinent to a particular airplane and crew member position. The complexity, operating costs, and operating environment of modern airplanes, together with the steady technological advances in flight simulation, have continued to encourage, and, in fact, have demanded, the expanded use of flight simulation (both FTDs and simulators) in the training and checking of flightcrew members.
b. The FAA has traditionally recognized the value of training devices and has awarded credit for their use in the completion of specific training and checking events in both general aviation and air carrier flight training programs and in pilot certification activities. Such credits are delineated in 14 CFR parts 61 and 121; and in other appropriate sources such as handbooks and guidance documents. These CFR sources, however, have, in the past, referred only to a "training device" or to a "flight training device," with no further descriptive information. Other sources had referred to flight training devices in several categories such as Cockpit Procedures Trainers, Cockpit Systems Simulators, Fixed Base Simulators, and other descriptors. Prior to the advent of the predecessor to this document, these categories and names had no standard definition or design criteria within the industry and no single source guidance document had existed to categorize these devices, to provide qualification standards for each category, or to relate one category to another in terms of capability or technical complexity. As a result, approval of these devices for use in training programs had not always been equitable. This circumstance has changed. The recognizable and understood technical definitions and descriptions in previous documents has provided a foundation. Knowledge of the

FAA-authorized uses of FTDs built on this foundation and has significantly influenced the flight training industry to increase the use of FTDs and has garnered support for multiplying that use in the future.
c. For information purposes, the following is a chronological listing of the documents preceding this document that have addressed the qualification criteria for airplane flight training device (FTD) evaluation and qualification by the FAA, including the effective dates of those documents: AC 120-45—05/11/87 to 02/05/92; AC 120-45A—02/05/92 to (date TBD).
End Information

5. Quality Assurance Program

Begin Rule Language (§ 60.5)

a. After [date 6 months after the effective date of the final rule], no sponsor may use or allow the use of or offer the use of an FTD for flightcrew member training or evaluation or for obtaining flight experience to meet any requirement of this chapter unless the sponsor has established and follows a quality assurance (QA) program, acceptable to the NSPM, for the continuing surveillance and analysis of the sponsor's performance and effectiveness in providing a satisfactory FTD for use on a regular basis as described in this QPS.
b. The QA program must provide a process for identifying deficiencies in the program and for documenting how the program will be changed to address these deficiencies.
c. Whenever the NSPM finds that the QA program does not adequately address the procedures necessary to meet the requirements of this part, the sponsor must, after notification by the NSPM, change the program so the procedures meet the requirements of this part.
d. Each sponsor of an FTD must identify to the NSPM and to the TPAA, by name, one individual, who is an employee of the sponsor, to be the management representative (MR) and the primary contact point for all matters between the sponsor and the FAA regarding the qualification of that FTD as provided for in this part.

End Rule Language (§ 60.5)

Begin QPS Requirements

e. The Director of Operations for a Part 119 certificate holder, the Chief Instructor for a Part 141 certificate holder, or the equivalent for a Part 142 or Flight Engineer School sponsor must designate a management representative (MR) who has the responsibility and authority to establish and modify the sponsor's policies, practices, and procedures regarding the QA program for the recurring qualification of, and the day-to-day use of, each FTD.
f. An acceptable Quality Assurance (QA) Program must contain a complete, accurate, and clearly defined written description of and/or procedures for—
(1) The method used by management to communicate the importance of meeting the regulatory standards contained in Part 60 and this QPS and the importance of establishing and meeting the requirements of a QA

Program as defined in this paragraph.

(2) The method(s) used by management to determine that the regulatory standards and the QA program requirements are being met, and if or when not met, what actions are taken to correct the deficiency and prevent its recurrence.
(3) The method used by management to determine that the sponsor is, on a timely and regular basis, presenting a qualified FTD.
(4) The criteria for and a definition or description of the workmanship expected for normal upkeep, repair, parts replacement, modification, etc., on the FTD and how, when, and by whom such workmanship is determined to be satisfactorily accomplished.
(5) The method used to maintain and control appropriate technical and reference documents, appropriate training records, and other documents for—
(a) Continuing FTD qualification; and
(b) The QA program.
(6) The criteria the sponsor uses (e.g., training, experience, etc.) to determine who may be assigned to duties of inspection, testing, and maintenance (preventive and corrective) on FTDs.
(7) The method used to track inspection, testing, and maintenance (preventive and corrective) on each FTD.
(8) The method used by the sponsor to inform the TPAA in advance of each scheduled NSPM-conducted evaluation and, after completion, the results of each such evaluation.
(9) The method used to ensure that FTD instructors, check airmen, and those who conduct the daily preflight are capable of determining what circumstance(s) constitute(s) a discrepancy regarding the FTD and its operation.
(10) The method used to ensure that instructors, check airmen, and those who conduct the daily preflight, record in the FTD discrepancy log each FTD discrepancy and each missing, malfunctioning, or inoperative FTD component.
(11) The method used to ensure that instructors and check airmen are completely and accurately logging the number of disruptions and time not available for training or for obtaining flight experience during a scheduled FTD use-period, including the cause(s) of the disruption.
(12) The method used by the sponsor to notify users of the FTD of missing, malfunctioning, or inoperative components that restrict the use of the FTD.
(13) The method of recording NSPM-conducted evaluations and other inspections (e.g., daily preflight inspections, NASIP inspections, sponsor conducted quarterly inspections, etc.), including the evaluation or inspection date, test results, discrepancies and recommendations, and all corrective actions taken.
(14) The method for ensuring that the FTD is configured the way the airplane it represents is configured and that if the configuration is authorized to be changed that the newly configured system(s) function(s) correctly.

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(15) The method(s) for:

(a) Determining whether or not proposed modifications to the airplane will affect the performance, handling, or other functions or characteristics of the airplane;

(b) Determining whether or not proposed modifications to the FTD will affect the performance, handling, or other functions or characteristics of the FTD; and

(c) Coordinating and communicating items 5.f.(15)(a) and (b) of this appendix, as appropriate, with the sponsor's training organization, other users (e.g., lease or service contract users), the TPAA, and the NSPM.

(16) How information found in the discrepancy log is used to correct discrepancies and how this information is used to review and, if necessary, modify existing procedures for FTD maintenance.

(17) The method for how and when software or hardware modifications are accomplished and tracked, documenting all changes made from the initial submission.

(18) The method used for determining that the FTD meets appropriate standards each day that it is used.

(19) The method for acquiring independent feedback regarding FTD operation (from persons recently completing training or obtaining flight experience; instructors and check airmen using the FTD for training or flight experience sessions; and FTD technicians and maintenance personnel) including a description of the process for addressing these comments.

(20) How devices used to test, measure, and monitor correct FTD operation are calibrated and adjusted for accuracy, including traceability of that accuracy to a recognized standard, and how these devices are maintained in good operating condition.

(21) How, by whom, and how frequently internal audits of the QA program are conducted and where and how the results of such audits are maintained and reported to Responsible Management, the NSPM, and the TPAA.

End QPS Requirements

Begin Information

g. Additional Information.

(1) In addition to specifically designated QA evaluations, the NSPM will evaluate the sponsor's QA program as part of regularly scheduled recurrent FTD evaluations and nonnotice

FTD evaluations, focusing in large part on the effectiveness and viability of the QA program and its contribution to the overall capability of the FTD to meeting the requirements of this part.

(2) The sponsor, through the MR, may delegate duties associated with maintaining the qualification of the FTD (e.g., corrective and preventive maintenance, scheduling for and the conducting of tests and/or inspections, functional preflight checks, etc.) but retains the responsibility and authority for the initial and day-to-day qualification and quality of the FTD. One person may serve in this capacity for more than one FTD, but one FTD would not have more than one

person serving in this capacity.

(3) Should a sponsor include a "foreign FTD" (i.e., one maintained by a non-US certificate holder) under their sponsorship, the sponsor remains responsible for the QA program for that FTD. However, if that foreign FTD is maintained under a QA program accepted by that foreign regulatory authority and that authority and the NSPM have agreed to accept each other's QA programs (e.g., the Joint Aviation Authorities, JAA, of Europe), the sponsor will be required only to perform an "external audit" of the non-US certificate holder's compliance with the accepted foreign QA program, with the results of that audit submitted to and accepted by the NSPM.

End Information

6. Sponsor Qualification Requirements

Begin Rule Language (§ 60.7)

a. A person is eligible to apply to be a sponsor of an FTD if the following conditions are met:

(1) The person holds, or is an applicant for, a certificate under part 119, 141, or 142 of this chapter; or holds, or is an applicant for, an approved flight engineer course in accordance with part 63 of this chapter.

(2) The FTD will be used, or will be offered for use, in the sponsor's FAA-approved flight training program for the airplane being simulated as evidenced in a request for evaluation submitted to the NSPM through the TPAA.

b. A person is a sponsor of the FTD if the following conditions are met:

(1) The person is a certificate holder under part 119, 141, or 142 of this chapter or has an approved flight engineer course in accordance with part 63 of this chapter.

(2) The person has operations specifications authorizing the use of the airplane type or set of airplanes being simulated by the FTD or has training specifications or a course of training authorizing the use of an FTD for that airplane type or set of airplanes.

(3) The person has an approved quality assurance program in accordance with § 60.5.

(4) The NSPM has approved the person as the sponsor of the FTD and that approval has not been withdrawn by the FAA.

c. A person continues to be a sponsor of an FTD, if the following conditions are met:

(1) Beginning 12 calendar months after the initial qualification and every 12 calendar months thereafter, the FTD must have been used within the sponsor's FAA-approved flight training program for the airplane type or set of airplanes for a minimum of 600 hours.

(2) The use of the FTD described in paragraph (c)(1) of this section must be dedicated to meeting the requirements of parts 61, 63, 91, 121, or 135 of this chapter.

(3) If the use requirements of paragraphs (c)(1) and (2) of this section are not met, the person will continue to sponsor the FTD on a provisional basis for a period not longer than 12 calendar months; and—

(i) If the FTD is used as described in

paragraphs (c)(1) and (2) of this section within this additional 12 calendar month period, the provisional status will be removed and regular sponsorship resumed; or

(ii) If the FTD is not used as described in paragraphs (c)(1) and (2) of this section within the additional 12 calendar month period, the FTD is not qualified and the sponsor will not be eligible to apply to sponsor that FTD for at least 12 calendar months.

End Rule Language (§ 60.7)

7. Additional Responsibilities of the Sponsor

Begin Rule Language (§ 60.9)

a. The sponsor must not allow the FTD to be used for flightcrew member training or evaluation or for attaining flight experience for the flightcrew member to meet any of the requirements under this chapter unless the sponsor, upon request, allows the NSPM to inspect immediately the FTD, including all records and documents relating to the FTD, to determine its compliance with this part.

b. The sponsor must, for each FTD—
(1) Establish a mechanism for the following persons to provide comments regarding the FTD and its operation and provide for receipt of those comments:

(i) Flightcrew members recently completing training or evaluation or recently obtaining flight experience in the FTD;

(ii) Instructors and check airmen using the FTD for training, evaluation, or flight experience sessions; and

(iii) Simulator technicians and maintenance personnel performing work on the FTD.

(2) Examine each comment received under paragraph (b)(1) of this section for content and importance and take appropriate action.

(3) Maintain a liaison with the manufacturer of the airplane being simulated by the FTD to facilitate compliance with § 60.13(f) when necessary.

(4) Post in or adjacent to the FTD the Statement of Qualification issued by the NSPM.

End Rule Language (§ 60.9)

8. FTD Use

Begin Rule Language (§ 60.11)

No person may use or allow the use of or offer the use of an FTD for meeting training, evaluation, or flight experience requirements of this chapter for flightcrew member certification or qualification unless, in accordance with the QPS for the specific device—

a. It has a single sponsor who is qualified under § 60.9. The sponsor may arrange with another person for services of document preparation and presentation, as well as FTD inspection, maintenance, repair, and servicing; however, the sponsor remains responsible for ensuring that these functions are conducted in a manner and with a result of continually meeting the requirements of this part.

b. It is qualified as described in the

Statement of Qualification that is required to be posted pursuant to § 60.9(b)(4)—

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- (1) For the make, model, and series of airplane or set of airplanes; and
- (2) For all tasks and configurations.
- c. It remains qualified, through satisfactory inspection, recurrent evaluations, appropriate maintenance, and use requirements in accordance with this part and the appropriate QPS.
- d. Its software and active programming used during the training, evaluation, or flight experience is the same as the software and active programming that was evaluated by the NSPM.

End Rule Language (§ 60.11)

Begin QPS Requirements

e. Only those FTDs that are used by a certificate holder (as defined for use in Part 60 and this QPS) will be evaluated by the NSPM. However, other FTD evaluations may be conducted on a case-by-case basis as the Administrator deems appropriate, but only in accordance with applicable agreements.

End QPS Requirements

Begin Information

f. Each FTD must be evaluated as completely as possible. To ensure a thorough and uniform evaluation, each FTD is subjected to the objective tests listed in attachment 2 of this appendix and the subjective tests listed in attachment 3 of this document. The evaluation(s) described herein will include, but not necessarily be limited to the following, as appropriate, for the qualification level of the FTD:

- (1) Aerodynamic responses, including longitudinal and lateral-directional control responses (see attachment 2 of this appendix);
- (2) Performance in authorized portions of the simulated airplane's, or set of airplanes'', operating envelope, to include tasks suitable to the NSPM in the areas of ground operations, takeoff, climb, cruise, descent, **approach, and landing as well as abnormal and emergency operations** (see attachment 2 of this appendix);
- (3) Control checks (see attachment 1 and attachment 2 of this appendix);
- (4) Cockpit configuration (see attachment 1 of this appendix);
- (5) Pilot, flight engineer, and instructor station functions checks (see attachment 1 and attachment 3 of this appendix);
- (6) Airplane, or set of airplanes, systems and sub-systems (as appropriate) as compared to the airplane or set of airplanes simulated (see attachment 1 and attachment 3 of this appendix);
- (7) FTD systems and sub-systems, including force cueing (motion), visual, and aural (sound) systems, as appropriate (see attachment 1 and attachment 2 of this appendix); and
- (8) Certain additional requirements, depending upon the complexity of the FTD qualification level sought, including equipment or circumstances that may become hazardous to the occupants. The sponsor may be subject to Occupational Safety and Health Administration requirements.

g. The NSPM administers the objective and subjective tests, which includes an examination of functions. The tests include a qualitative assessment of the FTD by an NSP pilot. The NSP evaluation team leader may assign other qualified personnel to assist in accomplishing the functions examination and/or the objective and subjective tests performed during an evaluation when required.

(1) Objective tests are used to compare FTD and airplane data objectively to ensure that the FTD performance and handling qualities are within specified tolerances.

(2) Subjective tests provide a basis for:

(a) evaluating the capability of the FTD to perform over a typical utilization period;

(b) determining that the FTD satisfactorily meets the appropriate training/testing/checking objectives and competently simulates each required maneuver, procedure, or task; and

(c) verifying correct operation of the FTD controls, instruments, and systems.

h. The tolerances for the test parameters listed in attachment 2 of this appendix are the maximum acceptable to the NSPM for FTD validation and are not to be confused with design tolerances specified for FTD manufacture. In making decisions regarding tests and test results, the NSPM relies on the use of operational and engineering judgment in the application of data (including consideration of the way in which the flight test was flown and way the data was gathered and applied) data presentations, and the applicable tolerances for each test.

i. In addition to the scheduled recurrent evaluation (see paragraph 14 of this appendix), each FTD is subject to evaluations conducted by the NSPM at any time with no prior notification to the sponsor. Such evaluations would be accomplished in a normal manner (i.e., requiring exclusive use of the FTD for the conduct of objective and subjective tests and an examination of functions) if the FTD is not being used for flightcrew member training, testing, or checking. However, if the FTD were being used, the evaluation would be conducted in a non-exclusive manner. This non-exclusive evaluation will be conducted by the FTD evaluator accompanying the check airman, instructor, Aircrew Program Designee (APD), or FAA inspector aboard the FTD along with the student(s) and observing the operation of the FTD during the training, testing, or checking activities. While the intent is to observe the operation and interaction of the device and not the check airman, instructor, APD, FAA inspector, or student(s), the FTD evaluator is a qualified FAA operations inspector and must, without question, report any obvious lack of proficiency to the appropriate POI or TCPM.

End Information

9. FTD Objective Data Requirements

Begin Rule Language (§ 60.13)

a. Except as provided in paragraphs (b) and (c) of this section, for the purposes of validating FTD performance and handling

qualities during evaluation for qualification, the sponsor must submit the airplane manufacturer's flight test data to the NSPM.

b. The sponsor may submit flight test data from a source in addition to or independent of the airplane manufacturer's data to the NSPM in support of an FTD qualification, but only if this data is gathered and developed by that source in accordance with flight test methods, including a flight test plan, as described in the appropriate QPS.

c. The sponsor may submit alternative data acceptable to the NSPM for consideration, approval and possible use in particular applications for FTD qualification.

d. Data or other material or elements must be submitted in a form and manner acceptable to the NSPM.

e. The NSPM may require additional flight testing to support certain FTD qualification requirements.

f. When an FTD sponsor learns, or is advised by an airplane manufacturer or supplemental type certificate (STC) holder, that an addition to, an amendment to, or a revision of the data used to program and operate an FTD used in the sponsor's training program is available, the sponsor must immediately notify the NSPM.

End Rule Language (§ 60.13)

Begin QPS Requirements

g. Flight test data used to validate FTD performance and handling qualities must have been gathered in accordance with a flight test program containing the following:

(1) A flight test plan, that contains:

(a) The required maneuvers and procedures.

(b) For each maneuver or procedure —

(i) The procedures and control input the flight test pilot and/or engineer are to use.

(ii) The atmospheric and environmental conditions.

(iii) The initial flight conditions.

(iv) The airplane configuration, including weight and center of gravity.

(v) The data that is to be gathered.

(vi) Any other appropriate factors.

(2) Appropriately qualified flight test personnel.

(3) An understanding of the accuracy of the data to be gathered.

(4) Appropriate and sufficient data acquisition equipment or system(s), including appropriate data reduction and analysis methods and techniques, as would be acceptable to the FAA's Aircraft Certification Service.

(5) Calibration of data acquisition equipment and airplane performance instrumentation must be current and traceable to a recognized standard.

h. The data presented, regardless of source, must be presented:

(1) in a format that supports the FTD validation process;

(2) in a manner that is clearly readable and annotated correctly and completely;

(3) with resolution sufficient to determine compliance with the tolerances set forth in attachment 2 of this appendix.

(4) with any necessary guidance

information provided; and

(5) without alteration, adjustments, or bias; however the data may be re-scaled, digitized, or otherwise manipulated to fit the desired presentation.

i. After completion of any additional flight test, a flight test report must be submitted in

10. Special Equipment and Personnel Requirements for Qualification of the FTD

Begin Rule Language (§ 60.14)

a. When notified by the NSPM, the sponsor must make available all special equipment and specifically qualified personnel needed to accomplish or assist in the accomplishment of tests during initial, recurrent, or special evaluations.

End Rule Language (§ 60.14)

Begin Information

b. Examples of a special evaluation would be an evaluation conducted at the request of the TPAA or as a result of comments received from users of the FTD that, upon analysis and confirmation, might cause a question as to the continued qualification or use of the FTD.
c. The NSPM will notify the sponsor at least 24 hours in advance of the evaluation if special equipment or personnel will be required to conduct the evaluation. Examples of special equipment include spot photometers, flight control measurement devices, sound analyzer, etc. Examples of special personnel would be those specifically qualified to install or use any special equipment when its use is required.

End Information

11. Initial (and Upgrade) Qualification Requirements

Begin Rule Language (§ 60.15)

a. For each FTD, the sponsor must submit a request through the TPAA to have the NSPM evaluate the FTD for initial qualification at a specific level. The request must be submitted in the form and manner described in the appropriate QPS.

b. The request must include all of the following:

- (1) A statement that the FTD meets all of the applicable provisions of this part.
- (2) A statement that the sponsor has established a procedure to verify that the configuration of hardware and software present during the evaluation for initial qualification will be maintained, except where modified as authorized in § 60.23. The statement must include a description of the procedure.
- (3) A statement signed by at least one pilot who meets the requirements of paragraph (c) of this section asserting that each pilot so approved has determined that the following requirements have been met:
 - (i) The FTD systems and sub-systems function equivalently to those in the airplane or set of airplanes.
 - (ii) The performance and flying qualities of the FTD are equivalent to those of the airplane or set of airplanes.
 - (iii) For type specific FTD's, the cockpit

support of the objective data. The report must contain sufficient data and rationale to support qualification of the FTD at the level requested.

End QPS Requirements

configuration conforms to the configuration of the airplane make, model, and series being simulated.

(4) A list of all of the operations tasks or FTD systems in the subjective test appendix of the appropriate QPS for which the FTD has not been subjectively tested (*e.g.*, circling approaches, windshear training, etc.) and for which qualification is not sought.

(5) A qualification test guide (QTG) that includes all of the following:

- (i) Objective data obtained from airplane testing or another approved source.
- (ii) Correlating objective test results obtained from the performance of the FTD as prescribed in the appropriate QPS.
- (iii) The general FTD performance or demonstration results prescribed in the appropriate QPS.
- (iv) A description of the equipment necessary to perform the evaluation for initial qualification and the recurrent evaluations for continuing qualification.

c. The pilot or pilots who make the statement required by paragraph (b)(3) of this section must—

- (1) Be designated by the sponsor;
- (2) Be approved by the TPAA; and
- (3) Be qualified in —

- (i) The airplane or set of airplanes being simulated; or
- (ii) For airplane types not yet issued a type certificate, an airplane type similar in size and configuration.

d. The subjective tests that form the basis for the statements described in paragraph (b)(3) of this section and the objective tests referenced in paragraph (b)(5) of this section must be accomplished at the sponsor's training facility except as provided for in the appropriate QPS.

e. The person seeking to qualify the FTD must provide the NSPM access to the FTD for the length of time necessary for the NSPM to complete the required evaluation of the FTD for initial qualification, which includes the conduct and evaluation of objective and subjective tests, including general FTD requirements, as described in the appropriate QPS, to determine that the FTD meets the standards in that QPS.

f. When the FTD passes an evaluation for initial qualification, the NSPM issues a Statement of Qualification that includes all of the following:

- (1) Identification of the sponsor.
- (2) Identification of the make, model, and series of the airplane or set of airplanes being simulated.
- (3) Identification of the configuration of the airplane of set or airplanes being simulated (*e.g.*, engine model or models, flight instruments, navigation or other systems, etc.).
- (4) A statement that the FTD is qualified as a flight training device.

Begin Information

j. Any necessary data and the flight test plan should be reviewed with the NSP staff well in advance of commencing the flight test.

End Information

(5) Identification of the qualification level of the FTD.

(6) A list of all of the operations tasks or FTD systems in the subjective test appendix of the appropriate QPS for which the FTD has not been subjectively tested and for which the FTD is not qualified (*e.g.*, circling approaches, windshear training, etc.).

g. After the NSPM completes the evaluation for initial qualification, the sponsor must update the QTG, with the results of the FAA-witnessed tests and demonstrations together with the results of all the objective tests and demonstrations described in the appropriate QPS.

h. Upon issuance of the Statement of Qualification the updated QTG becomes the MQTG and must then be made available to the FAA upon request.

End Rule Language (§ 60.15)

Begin QPS Requirement

i. The QTG described in paragraph 11.b.(4) of this appendix, must provide the documented proof of compliance with the FTD objective tests in attachment 2 of this appendix.

j. The QTG is prepared and submitted by the sponsor, or the sponsor's agent on behalf of the sponsor, through the TPAA to the NSPM for review and approval, and must include, for each objective test:

- (1) parameters, tolerances, and flight conditions;
- (2) pertinent and complete instructions for the conduct of automatically and manually conducted tests;
- (3) a means of comparing the FTD's test results to the objective data;
- (4) statements of how a particular test was accomplished or that certain requirements have been met (see appendices to this document for additional information);
- (5) other information appropriate to the qualification level of the FTD.

k. The QTG described in paragraph 11.b.(4) of this appendix, must include the following:

- (1) A QTG cover page with sponsor and FAA approval signature blocks (see attachment 5, Figure 2, of this appendix for a sample QTG cover page).
- (2) A recurrent evaluation schedule requirements page “ to be used by the NSPM to establish and record the frequency with which recurrent evaluations must be conducted and any subsequent changes that may be determined by the NSPM. See attachment 5, Figure 4, of this appendix for a sample Recurrent Evaluation Schedule Requirements page.
- (3) An FTD information page that provides the information listed below (see attachment 5, Figure 3, of this appendix for a sample FTD information page). For convertible FTDs, a separate page is submitted for each configuration of the FTD.

(a) The sponsor's FTD identification number or code.

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- (b) The airplane model and series, or set of airplanes, being simulated.
- (c) The aerodynamic data revision number or reference.
- (d) The engine model(s) and its data revision number or reference.
- (e) The flight control data revision number or reference.
- (f) The flight management system identification and revision level.
- (g) The FTD model and manufacturer.
- (h) The date of FTD manufacture.
- (i) The FTD computer identification.
- (j) The visual system model and manufacturer, including display type., **if applicable.**
- (k) The motion system type and manufacturer, including degrees of freedom., **if applicable.**
- (4) A Table of Contents.
- (5) A log of revisions and a list of effective pages.
- (6) The source data.
- (7) A glossary of terms and symbols used (including sign conventions and units).
- (8) Statements of compliance and capability (SOC's) with certain requirements. SOC's must provide references to the sources of information for showing the capability of the FTD to comply with the requirement, a rationale explaining how the referenced material is used, mathematical equations and parameter values used, and the conclusions reached; *i.e.* that the FTD complies with the requirement. Refer to the "Additional Details" column in attachment 1 of this appendix, "FTD Standards," or in the "Test Details" column in attachment 2 of this appendix, "FTD Objective Tests," to see when SOC's are required.
- (9) Recording procedures or equipment required to accomplish the objective tests.
- (10) The following information for each objective test designated in attachment 2 of this appendix, as applicable to the qualification level sought.
 - (a) Name of the test.
 - (b) Objective of the test.
 - (c) Initial conditions.
 - (d) Manual test procedures.
 - (e) Automatic test procedures (if applicable).
 - (f) Method for evaluating FTD objective test results.
 - (g) List of all parameters driven or constrained during the automatically conducted test(s).
 - (h) List of all parameters driven or constrained during the manually conducted test(s).
 - (i) Tolerances for relevant parameters.
 - (j) Source of Airplane Test Data (document and page number).
 - (k) Copy of the Airplane Test Data (if located in a separate binder, a cross reference for the identification and page number for pertinent data location must be provided).
 - (l) FTD Objective Test Results as obtained by the sponsor. Each test result must reflect the date completed and must be clearly labeled as a product of the device being tested.
- l. Form and manner of presentation of

objective test results in the QTG:

- (1) The sponsor's FTD test results must be recorded in a manner, acceptable to the NSPM, that will allow easy comparison of the FTD test results to airplane test data (*e.g.*, use of a multi-channel recorder, line printer, cross plotting, overlays, transparencies, etc.).
- (2) FTD results must be labeled using terminology common to airplane parameters as opposed to computer software identifications.
- (3) Airplane data documents included in a QTG may be photographically reduced only if such reduction will not alter the graphic scaling or cause difficulties in scale interpretation or resolution.
- (4) Scaling on graphical presentations must provide the resolution necessary to evaluate the parameters shown in attachment 2 of this appendix.
- (5) For tests involving time histories, flight test data sheets (or transparencies thereof) and FTD test results must be clearly marked with appropriate reference points to ensure an accurate comparison between FTD and airplane with respect to time. Time histories recorded via a line printer are to be clearly identified for cross-plotting on the airplane data. Over-plots must not obscure the reference data.
- m. The sponsor may elect to complete the QTG objective tests at the manufacturer's facility. Tests performed at this location must be conducted after assembly of the FTD has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FTD performance at the sponsor's training facility by repeating a representative sampling of all the objective tests in the QTG and submitting these repeated test results to the NSPM. This sample must consist of at least one-third of the QTG objective tests. The QTG must be clearly annotated to indicate when and where each test was accomplished.
- n. The sponsor may elect to complete the subjective tests at the manufacturer's facility. Tests performed at this location will be conducted after assembly of the FTD has been essentially completed, the systems and sub-systems are functional and operate in an interactive manner, and prior to the initiation of disassembly for shipment. The sponsor must substantiate FTD performance at the sponsor's training facility by having the pilot(s) who performed these tests originally (or similarly qualified pilot(s)), repeat a representative sampling of these subjective tests and submit a statement to the NSPM that the FTD has not changed from the original determination. The report must clearly indicate when and where these repeated tests were completed, but need not take more than one normal FTD period (*e.g.*, 4 to 8 hours) to complete.
- o. The sponsor must maintain a copy of the MQTG at the FTD location. After [date 6 years from the effective date of the final rule] all MQTG's, regardless of initial qualification date of the FTD, must be available in an electronic format, acceptable to the NSPM.

The electronic MQTG must include all objective data obtained from airplane testing, or another approved source (reformatted or digitized), together with correlating objective test results obtained from the performance of the FTD (reformatted or digitized) as prescribed in this document, the general FTD performance or demonstration results (reformatted or digitized) prescribed in this document, and a description of the equipment necessary to perform the evaluation for initial qualification and the recurrent evaluations for continuing qualification. This electronic MQTG must include the original airplane flight test data used to validate FTD performance and handling qualities in either the original digitized format from the data supplier or an electronic scan of the original flight test timehistory plots that were provided by the data supplier. An electronic copy of MQTG must be provided to the NSPM.

End QPS Requirements

Begin Information

p. Problems with objective test results are handled according to the following:

- (1) If a problem with an objective test result is detected by the NSP evaluation team during an evaluation, the test may be repeated and/or the QTG may be amended.
- (2) If it is determined that the results of an objective test do not support the level requested but do support a lower level, the NSPM may qualify the FTD at that lower level. For example, if a Level 6 evaluation is requested and the FTD fails to meet the Level 6 Spiral Stability test tolerances but does meet the Level 5 tolerances, it could be qualified at Level 5.

q. After the NSPM issues a statement of qualification to the sponsor when an FTD is successfully evaluated, the FTD is recommended to the TPAA, who will exercise authority on behalf of the Administrator in approving the FTD in the appropriate airplane flight training program.

r. Under normal circumstances, the NSPM establishes a date for the initial or upgrade evaluation within 10 working days after determining that a complete QTG is acceptable. Unusual circumstances may warrant establishing an evaluation date before this determination is made; however, once a schedule is agreed to, any slippage of the evaluation date at the sponsor's request may result in a significant delay, perhaps 45 days or more, in rescheduling and completing the evaluation. A sponsor may commit to an initial evaluation date under this early process, in coordination with and the agreement of the NSPM, but the request must be in writing and must include an acknowledgment of the potential schedule impact if the sponsor slips the evaluation from this early-committed date. See attachment 5, figure 5 of this appendix, Sample Request for Initial Evaluation Date.

s. A convertible FTD is addressed as a separate FTD for each model and series airplane or set of airplanes to which it will be converted and for the FAA qualification

level sought. An NSP evaluation is required for each configuration. For example, if a sponsor seeks qualification for two models of an airplane type using a convertible FTD, two

QTG's, or a supplemented QTG, and two evaluations are required.
t. The numbering system used for objective test results in the QTG should closely follow

the numbering system set out in attachment 2 of this appendix, FTD Objective Tests.

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End Information

12. Additional Qualifications for Currently Qualified FTD's

Begin Rule Language (§ 60.16)

a. A currently qualified FTD is required to undergo an additional qualification process if a user intends to use the FTD for meeting training, evaluation, or flight experience requirements of this chapter beyond the qualification issued to the sponsor. This process consists of the following—

(1) The sponsor:

- (i) Must submit to the NSPM all modifications to the MQTG that are required to support the additional qualification.
- (ii) Must describe to the NSPM all modifications to the FTD that are required to support the additional qualification.
- (iii) Must submit a statement to the NSPM that a pilot, designated by the sponsor in accordance with § 60.15(c) and approved by the TPAA for the user, has subjectively evaluated the FTD in those areas not previously evaluated.

(2) The FTD must successfully pass an evaluation—

- (i) For initial qualification, in accordance with § 60.15, in those circumstances where the NSPM has determined that a full evaluation for initial qualification is necessary; or
 - (ii) For those elements of an evaluation for initial qualification (e.g., objective tests, performance demonstrations, or subjective tests) designated as necessary by the NSPM.
- b. In making the determinations described in paragraph (a)(2) of this section, the NSPM considers factors including the existing qualification of the FTD, any modifications to the FTD hardware or software that are involved, and any additions or modifications to the MQTG.

c. The FTD is qualified for the additional uses when the NSPM issues an amended Statement of Qualification in accordance with § 60.15(f).

d. The sponsor may not modify the FTD except as described in § 60.23.

End Rule Language (§ 60.16)

13. Previously Qualified FTDs

Begin Rule Language (§ 60.17)

a. Unless otherwise specified by an FSD Directive, further referenced in the appropriate QPS, or as specified in paragraph (e) of this section, an FTD qualified before [the effective date of the final rule] will retain its qualification as long as it continues to meet the standards, including the performance demonstrations and the objective test results recorded in the MQTG, under which it was originally evaluated, regardless of sponsor, and as long as the sponsor complies with the applicable provisions of this part.

b. If the FTD qualification is lost under § 60.27 and not restored under § 60.27 for two (2) years or more, the qualification basis for the re-qualification will be those standards in effect and current at the time of re-qualification application.

c. Except as provided in paragraph (d) of this section, any change in FTD qualification level initiated on or after [the effective date of the final rule] requires an evaluation for initial qualification in accordance with this part.

d. The NSPM may downgrade a qualified FTD without requiring and without conducting an initial evaluation for the new qualification level. Subsequent recurrent evaluations will use the existing MQTG, modified as necessary to reflect the new qualification level.

e. When the sponsor has appropriate validation data available and receives approval from the NSPM, the sponsor may adopt tests and associated tolerances described in the current qualification standards as the tests and tolerances applicable for the continuing qualification of a previously qualified FTD. The updated test(s) and tolerance(s) must be made a permanent part of the MQTG.

End Rule Language (§ 60.17)

Begin Information

f. Other certificate holders or persons desiring to use an FTD may contract with FTD sponsors to use those FTDs already qualified at a particular level for an airplane type or set of airplanes and approved for use within an FAA-approved flight training program. Such FTDs are not required to undergo an additional qualification process, except as described in paragraph 12, of this appendix.

Note: The reader is reminded of the requirement that each FTD user obtain approval for use of each FTD in an FAA approved flight training program from the appropriate TPAA.

End Information

14. Inspection, Maintenance, and Recurrent Evaluation Requirements

Begin Rule Information (§ 60.19)

a. Inspection. No sponsor may use or allow the use of or offer the use of an FTD for meeting training, evaluation, or flight experience requirements of this chapter for flightcrew member certification or qualification unless the sponsor does the following:

- (1) Accomplishes all appropriate QPS Appendix 1 performance demonstrations and all appropriate QPS Appendix 2 objective tests each year. To do this, the sponsor must conduct a minimum of four evenly spaced inspections throughout the year, as approved by the NSPM. The performance

demonstrations and objective test sequence and content of each inspection in this sequence will be developed by the sponsor and submitted to the NSPM for approval. In deciding whether to approve the test sequence and the content of each inspection, the NSPM looks for a balance and a mix from the performance demonstrations and objective test requirement areas listed as follows:

- (i) Performance.
 - (ii) Handling qualities.
 - (iii) Motion system (where appropriate).
 - (iv) Visual system (where appropriate).
 - (v) Sound system (where appropriate).
 - (vi) Other FTD systems.
- (2) Completes a functional preflight check in accordance with the appropriate QPS each calendar day prior to the start of the first FTD period of use that begins in that calendar day.
- (3) Completes at least one functional preflight check in accordance with the appropriate QPS in every 7 consecutive calendar days.

(4) Maintains a discrepancy log.

(5) Ensures that, when a discrepancy is discovered, the following requirements are met:

(i) Each discrepancy entry must be maintained in the log until the discrepancy is corrected as specified in § 60.25(b) and for at least 30 days thereafter.

(ii) The corrective action taken for each discrepancy and the date that action is taken must be entered in the log. This entry concerning the corrective action must be maintained for at least 30 days thereafter.

(iii) The discrepancy log is kept in a form and manner acceptable to the Administrator and is kept in or immediately adjacent to the FTD.

b. Recurrent evaluation.

(1) This evaluation consists of performance demonstrations, objective tests, and subjective tests, including general FTD requirements, as described in the appropriate QPS or as may be amended by an FSD Directive.

(2) The sponsor must contact the NSPM to schedule the FTD for recurrent evaluations not later than 60 days before the recurrent evaluation is due.

(3) The sponsor must provide the NSPM access to the objective test results and general FTD performance or demonstration results in the MQTG, and access to the FTD for the length of time necessary for the NSPM to complete the required recurrent evaluations, weekdays between 6 o'clock AM (local time) and 6 o'clock PM (local time).

(4) No sponsor may use, or allow the use of, or offer the use of, an FTD for flightcrew member training or evaluation or for obtaining flight experience for the flightcrew member to meet the requirements of this chapter unless the FTD has passed an NSPM-conducted recurrent evaluation within the

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previous 12 calendar months or as otherwise provided for in the MQTG.

(5) Recurrent evaluations conducted in the calendar month before or after the calendar month in which these recurrent evaluations

are required will be considered to have been conducted in the calendar month in which they were required.

c. Maintenance. The sponsor is responsible for continuing corrective and preventive

maintenance on the FTD to ensure that it continues to meet the requirements of § 60.15(b).

End Rule Language (§ 60.19)

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Begin QPS Requirement

d. The preflight inspections described in paragraphs 14.a.(2) and (3) of this appendix, must consist of, as a minimum—

(1) An exterior inspection of the FTD for appropriate hydraulic (if applicable), pneumatic, and electrical connections (*e.g.*, in place, not leaking, appear serviceable);
(2) A check that the area around the FTD is free of potential obstacles throughout the motion system range (if applicable);
(3) A review of the FTD discrepancy log;
(4) A functional check of the major FTD systems and simulated airplane, or set of airplanes, systems (*e.g.*, cockpit instrumentation, control loading, and adequate air flow for equipment cooling) by doing the following:

(a) Turn on main power, including motion system (if applicable), and allow to stabilize.
(b) Connect airplane power. This may be connected through “quick start” of airplane engines, auxiliary power unit, or ground power. Airplane operations will require operating engines.

(c) A general look for light bulb function, lighted instruments and switches, etc., as well as inoperative “flags” or other such indications.

(d) Check Flight Management System(s) (and other date-critical information) for proper date range.

(e) Select takeoff position and from either pilot position, if applicable, observe the visual system, for proper operation (including light-point color balance and convergence, edge-matching and blending, etc.).

(f) If applicable, adjust visibility value to inside of the far end of the runway and release “position freeze or flight freeze.” From either pilot position, advance power to taxi down the runway (if applicable, observe visual system; check sound system and engine instrument response) and apply spoiler/speed brake, if applicable, and wheel brakes (to check spoiler/speed brake and wheel brake operation); select reverse thrust, if applicable, to check normal operation and continued deceleration.

(g) Select position on final approach, at least five (5) miles out (if applicable, observe visual scene). From either pilot position, adjust airplane configuration appropriately (if applicable, check for normal gear and flap operation). If applicable, adjust visibility to see entire airport. Release “position freeze” or “flight freeze.” Make a rapid left and right bank (check control feel and freedom; observe proper airplane response; and exercise motion system, if applicable). Observe simulated airplane systems operation.

(h) Extend gear and flaps,

(i) Fly to and land at airport, or select takeoff position.

(j) Shut down engines, turn off lights, turn off main power supply and motion system, as applicable.

(k) Record “functional preflight” in the FTD discrepancy log book, including any item found to be missing, malfunctioning, or inoperative.

End QPS Requirements

Begin Information

e. If the NSP evaluator plans to accomplish specific tests during a normal recurrent evaluation that requires the use of special equipment or technicians, the sponsor will be notified as far in advance of the evaluation as practical; usually not less than 24 hours. These tests include latencies, control dynamics, sounds and vibrations, motion, and/or some visual system tests as may be applicable.

f. The recurrent evaluations described in paragraph 13.a.(7) of this appendix, require approximately eight (8) hours of FTD time and consist of the following:

(1) A review of the results of the objective tests and all the designated FTD performance demonstrations conducted by the sponsor since the last scheduled recurrent evaluation.

(2) At the discretion of the evaluator, a selection of approximately 20 percent of those objective tests conducted since the last scheduled recurrent evaluation and a selection of approximately 10 percent of the remaining objective tests in the MQTG. The tests chosen will be performed either automatically or manually, at the discretion of the evaluator.

(3) A subjective test of the FTD to perform a representative sampling of the tasks set out in appendix 3 of this document, selected at the discretion of the evaluator.

(4) An examination of the functions of the FTD, including, but not necessarily limited to the motion, visual, and sound system as applicable, and the instructor operating station, including the normal and simulated malfunctions of the simulated airplane systems.

End Information

15. Logging FTD Discrepancies

Begin Rule Language (§ 60.20)

Each instructor, check airman, or representative of the Administrator conducting training or evaluation, or observing flight experience for flightcrew member certification or qualification, and each person conducting the preflight inspection (§ 60.19(a)(2), (3), and (4)), who discovers a discrepancy, including any missing, malfunctioning, or inoperative components in the FSD, must write or cause to be written a description of that discrepancy into the discrepancy log at the end of the FSD preflight or FSD use session.

End Rule Language (§ 60.20)

16. [Reserved]

17. Modifications to FTDs

Begin Rule Language (§ 60.23)

a. When the sponsor or the FAA determines that any of the following circumstances exist and the FAA determines that the FTD cannot be used adequately to train, evaluate, or provide flight experience for flightcrew members, the sponsor must modify the FTD accordingly:

(1) The airplane manufacturer or another approved source develops new data regarding the performance, functions, or other characteristics of the airplane or set of airplanes being simulated;

(2) A change in airplane performance, functions, or other characteristics occurs;

(3) A change in operational procedures or requirements occurs; or

(4) Other circumstances as determined by the NSPM.

b. When the FAA determines that FTD modification is necessary for safety of flight reasons, the sponsor of each affected FTD must ensure that the FTD is modified according to the FSD Directive regardless of the original qualification standards applicable to any specific FTD.

c. Before modifying a qualified FTD, the sponsor must notify the NSPM and the TPAA as follows:

(1) The notification must include a complete description of the planned modification, including a description of the operational and engineering effect the proposed modification will have on the operation of the FTD.

(2) The notification must be submitted in a form and manner as specified in the appropriate QPS.

d. If the sponsor intends to add additional equipment or devices intended to simulate airplane appliances; modify hardware or software which would affect flight or ground dynamics, including revising FTD programming or replacing or modifying the host computer; or if the sponsor is changing or modifying the control loading system (or motion, visual, or sound system for FTD levels requiring these tests and measurements), the following applies:

(1) The sponsor must meet the notification requirements of paragraph (c) of this section and must include in the notification the results of all objective tests that have been rerun with the modification incorporated, including any necessary updates to the MQTG.

(2) However, the sponsor may not use, or allow the use of, or offer the use of, the FTD with the proposed modification for flightcrew member training or evaluation or for obtaining flight experience for the flightcrew member to meet the requirements of this chapter unless or until the sponsor receives written notification from the NSPM approving the proposed modification. Prior to approval, the NSPM may require that the modified FTD be evaluated in accordance with the standards for an evaluation for initial qualification or any part thereof before it is placed in service.

e. The sponsor may not modify a qualified FTD until one of the following has occurred:

(1) For circumstances described in paragraph (b) or (d) of this section, the sponsor receives written approval from the NSPM that the modification is authorized.

(2) For circumstances other than those described in paragraph (b) or (d) of this section, either:

(i) Twenty-one days have passed since the sponsor notified the NSPM and the TPAA of

the proposed modification and the sponsor

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has not received any response from the NSPM or TPAA; or

(ii) The NSPM or TPAA approves the proposed modification in fewer than 21 days since the sponsor notified the NSPM and the TPAA of the proposed modification.

f. When a modification is made to an FTD, the sponsor must notify each certificate holder planning to use that FTD of that modification prior to that certificate holder using that FTD the first time after the modification is complete.

g. The MQTG must be updated with current objective test results in accordance with § 60.15(b)(5) and appropriate flight test data in accordance with § 60.13, each time an FTD is modified and an objective test is affected by the modification. If this update is initiated by an FSD Directive, the direction to make the modification and the record of the modification completion must be filed in the MQTG.

End Rule Language (§ 60.23)

Begin QPS Requirements

h. The notification described in paragraph 17.c.(1) of this appendix, will include a statement signed by a pilot, qualified in the airplane type, or set of airplanes, being simulated and designated by the sponsor, that, with the modification proposed—

- (1) the FTD systems and sub-systems function equivalently to those in the airplane, or set of airplanes, being simulated;
- (2) the performance and flying qualities of the FTD are equivalent to those of the airplane, or set of airplanes, being simulated; and
- (3) the cockpit configuration conforms to the configuration of the airplane, or set of airplanes, being simulated.

End QPS Requirements

18. Operation With Missing, Malfunctioning, or Inoperative Components

Begin Rule Language (§ 60.25)

a. No person may use or allow the use of or offer the use of an FTD with a missing, malfunctioning, or inoperative component for meeting training, evaluation, or flight experience requirements of this chapter for flightcrew member certification or qualification during maneuvers, procedures, or tasks that require the use of the correctly operating component.

b. Each missing, malfunctioning, or inoperative component must be repaired or replaced within 30 calendar days unless otherwise authorized by the NSPM. Failure to repair or replace this component within the prescribed time may result in loss of FTD qualification.

c. Each missing, malfunctioning, or inoperative component must be placarded as such on or adjacent to that component in the FTD and a list of the currently missing, malfunctioning, or inoperative components must be readily available in or immediately adjacent to the FTD for review by users of the device.

End Rule Language (§ 60.25)

19. Automatic Loss of Qualification and Procedures for Restoration of Qualification

Begin Rule Language (§ 60.27)

a. An FTD is not qualified if any of the following occurs:

- (1) The FTD is not used in the sponsor's FAA-approved flight training program in accordance with § 60.9(b)(4).
- (2) The FTD is not maintained and inspected in accordance with § 60.19.
- (3) The FTD is physically moved from one location to another, regardless of distance.
- (4) The FTD is disassembled (e.g., for repair or modification) to such an extent that it cannot be used for training, evaluation, or experience activities.
- (5) The MQTG is missing or otherwise not available and a replacement is not made within 30 days.

b. If FTD qualification is lost under paragraph (a) of this section, qualification is restored when either of the following provisions are met:

- (1) The FTD successfully passes an evaluation:
 - (i) For initial qualification, in accordance with § 60.15 in those circumstances where the NSPM has determined that a full evaluation for initial qualification is necessary; or
 - (ii) For those elements of an evaluation for initial qualification approved as necessary by the NSPM.
 - (2) The NSPM or the TPAA advises the sponsor that an evaluation is not necessary.
- c. In making the determinations described in paragraph (b) of this section, the NSPM considers factors including the number of inspections and recurrent evaluations missed, the amount of disassembly and reassembly of the FTD that was accomplished, and the care that had been taken of the device since the last evaluation.

End Rule Language (§ 60.27)

20. Other Losses of Qualification and Procedures for Restoration of Qualification

Begin Rule Language (§ 60.29)

a. Except as provided in paragraph (c) of this section, when the NSPM or the TPAA notifies the sponsor that the FTD no longer meets qualification standards, the following procedure applies:

- (1) The NSPM or the TPAA notifies the sponsor in writing that the FTD no longer meets some or all of its qualification standards.
- (2) The NSPM or the TPAA sets a reasonable period (but not less than 7 days) within which the sponsor may submit written information, views, and arguments on the FTD qualification.
- (3) After considering all material presented, the NSPM or the TPAA notifies the sponsor of the FTD qualification.
- (4) If the NSPM or the TPAA notifies the sponsor that some or all of the FTD is no longer qualified, it becomes effective not less than 30 days after the sponsor receives notice of it unless—

(i) The NSPM or the TPAA find under paragraph. of this section that there is an emergency requiring immediate action with respect to safety in air transportation or air commerce; or

(ii) The sponsor petitions for reconsideration of the NSPM or the TPAA finding under paragraph (b) of this section. b. When a sponsor seeks reconsideration of a decision from the NSPM or the TPAA concerning the FTD qualification, the following procedure applies:

- (1) The sponsor must petition for reconsideration of that decision within 30 days of the date that the sponsor receives a notice that some or all of the FTD is no longer qualified.
 - (2) The sponsor must address its petition to the Director, Flight Standards Service.
 - (3) A petition for reconsideration, if filed within the 30-day period, suspends the effectiveness of the determination by the NSPM or the TPAA that the FTD is no longer qualified unless the NSPM or the TPAA has found, under paragraph (c) of this section, that an emergency exists requiring immediate action with respect to safety in air transportation or air commerce.
- c. If the NSPM or the TPAA find that an emergency exists requiring immediate action with respect to safety in air transportation or air commerce that makes the procedures set out in this section impracticable or contrary to the public interest:

- (1) The NSPM or the TPAA withdraws qualification of some or all of the FTD and makes the withdrawal of qualification effective on the day the sponsor receives notice of it.
- (2) In the notice to the sponsor, the NSPM or the TPAA articulates the reasons for its finding that an emergency exists requiring immediate action with respect to safety in air transportation or air commerce or that makes it impracticable or contrary to the public interest to stay the effectiveness of the finding.

End Rule Language (§ 60.29)

21. Recordkeeping and Reporting

Begin Rule Language (§ 60.31)

a. The FTD sponsor must maintain the following records for each FTD it sponsors:

- (1) The MQTG and each amendment thereto.
- (2) A copy of the programming used during the evaluation of the FTD for initial qualification and for any subsequent upgrade qualification, and a copy of all programming changes made since the evaluation for initial qualification.
- (3) A copy of all of the following:
 - (i) Results of the evaluations for the initial and each upgrade qualification.
 - (ii) Results of the quarterly objective tests and the approved performance demonstrations conducted in accordance with § 60.19(a) for a period of 2 years.
 - (iii) Results of the previous three recurrent evaluations, or the recurrent evaluations from

the previous 2 years, whichever covers a longer period.

(iv) Comments obtained in accordance with § 60.9(b)(1) for a period of at least 18 months.

(4) A record of all discrepancies entered in the discrepancy log over the previous 2 years, including the following:

(i) A list of the components or equipment that were or are missing, malfunctioning, or inoperative.

(ii) The action taken to correct the discrepancy.

(iii) The date the corrective action was taken.

(5) A record of all modifications to FTD hardware configurations made since initial qualification.

b. The FTD sponsor must keep a current record of each certificate holder using the FTD. The sponsor must provide a copy of this list to the NSPM at least semiannually.

c. The records specified in this section must be maintained in plain language form or in coded form, if the coded form provides for the preservation and retrieval of information in a manner acceptable to the NSPM.

d. The sponsor must submit an annual report, in the form of a comprehensive statement signed by the quality assurance primary contact point, certifying that the FTD continues to perform and handle as qualified by the NSPM.

End Rule Language (§ 60.31)

22. Applications, Logbooks, Reports, and Records: Fraud, Falsification, or Incorrect Statements

Begin Rule Language (§ 60.33)

a. No person may make, or cause to be made, any of the following:

(1) A fraudulent or intentionally false statement in any application or any amendment thereto, or any other report or test result required by this part or the QPS.

(2) A fraudulent or intentionally false statement in or omission from any record or report that is kept, made, or used to show compliance with this part or the QPS, or to exercise any privileges under this chapter.

(3) Any reproduction or alteration, for fraudulent purpose, of any report, record, or test result required under this part or the QPS.

b. The commission by any person of any act prohibited under paragraph (a) of this section is a basis for any one or any combination of the following:

(1) A civil penalty.

(2) Suspension or revocation of any certificate held by that person that was issued under this chapter.

(3) The removal of FTD qualification and approval for use in a training program.

c. The following may serve as a basis for removal of qualification of an FTD including the withdrawal of authorization for use of an FTD; or denying an application for a qualification:

(1) An incorrect statement, upon which the

FAA relied or could have relied, made in support of an application for a qualification or a request for approval for use.

(2) An incorrect entry, upon which the FAA relied or could have relied, made in any logbook, record, or report that is kept, made, or used to show compliance with any requirement for an FTD qualification or an approval for use.

End Rule Language (§ 60.33)

23. [Reserved]

24. Levels of FTD.

Begin Information

a. The following is a general description of each level of FTD. Detailed standards and tests for the various levels of FTDs are fully defined in attachments 1 through 3 of this appendix.

(1) *Level 1.* Currently Reserved for possible future use.

(2) *Level 2.* A device that may have an open flight deck area, or an enclosed cockpit; a generic aero program that is representative of the simulated airplane, or set of airplanes; at least one fully functional system; and control loading that, as a minimum, is representative of the simulated airplane, or set of airplanes, only at an approach speed.

(3) *Level 3.* A device that has an enclosed generic cockpit with a generic aerodynamic program; all applicable operating systems; control loading that is representative of the simulated airplane, or set of airplanes, throughout its ground and flight envelope; and significant sound representation.

(4) *Level 4.* A device that may have an open, airplane-specific, flight deck area, or an enclosed, airplane-specific cockpit; at least one operating system; and possessing at least air/ground logic (no aerodynamic programming required).

(5) *Level 5.* A device that may have an open, airplane-specific, flight deck area, or an enclosed, airplane-specific cockpit, with a generic aerodynamic program; at least one operating system; and control loading that as a minimum is representative of the simulated airplane only at an approach speed.

(6) *Level 6.* A device that has an enclosed, airplane-specific cockpit and aerodynamic program; all airplane systems operating; control loading that is representative of the simulated airplane throughout its ground and flight envelope; and significant sound representation.

Comment — What is rationale to delete level 7, that is part of AC 120-45A?

b. Non-visual simulators have been placed into Level 6 for reference purposes. The placement of these unique simulators into this level has not affected the standards or criteria of Level 6 FTDs, nor will these FTDs affect the standards or criteria of these simulators.

End Information

25. [Reserved]

Attachment 1 to Appendix B to Part 60— General FTD Requirements

1. General

Begin QPS Requirements

a. Requirements

Certain FTD requirements included in this appendix must be supported with a Statement of Compliance and Capability (SOC) and, in designated cases, FTD performance must be recorded and the results made part of the QTG. In the following tabular listing of FTD standards, requirements for SOC's are indicated in the "Additional Details" column.

End QPS Requirements

b. Discussion

Begin Information

(1) This attachment describes the minimum requirements for qualifying Level 2 through Level 6 flight training devices (information regarding Level 1 FTDs is found in paragraph 24 in the body of this QPS). To determine the complete requirements for a specific level FTD, the objective tests in attachment 2 and the subjective tests listed in attachment 3 for this QPS must be consulted.

(2) The material contained in this attachment is divided into the following categories:

(a) General cockpit configuration.

(b) Simulator programming.

(c) Equipment operation.

(d) Equipment and facilities for instructor/evaluator functions.

(e) Sound system.

End Information

Tables 2.a. & 2.c. --- There is duplication of requirements for "circuit breakers" for location and functionality in these tables. Duplication should be corrected.

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TABLE OF MINIMUM FLIGHT TRAINING DEVICE REQUIREMENTS INFORMATION								
QPS Requirement	FTD level						Additional details	Notes
General FTD Standards	1	2	3	4	5	6		
2. General Cockpit Configuration:								
a. The FTD must have a cockpit that is a full-scale replica of the airplane, or set of airplanes, simulated with controls, equipment, observable cockpit indicators, circuit breakers, and bulkheads properly located, functionally accurate and replicating the airplane or set of airplanes. The direction of movement of controls and switches must be identical to that in the airplane or set of airplanes.			X			X	Level 3 must be representative of a single set of airplanes, and must have navigation controls, displays, and instrumentation as set out in 14 CFR Part 91, §91.33 for operation in accordance with instrument flight rules (IFR). Crewmember seats must afford the capability for the occupant to be able to achieve the design "eye position" for specific airplanes, or to approximate such a position for a generic set of airplanes.	For FTD purposes, the cockpit consists of all that space forward of a cross section of the fuselage at the most extreme aft setting of the pilots' seats including additional, required crewmember duty stations and those required bulkheads aft of the pilot seats.
b. The FTD must have equipment (i.e., instruments, panels, systems, and controls) simulated sufficiently for the authorized training/checking events to be accomplished. The installed equipment must be located in a spatially correct configuration, and may be in a cockpit or an open flight deck area. Actuation of this equipment must replicate the appropriate function in the airplane.		X		X	X		Level 2 must be representative of a single set of airplanes.	
c. Circuit breakers must function accurately when they are involved in operating procedures or malfunctions requiring or involving flight crew response.		X	X		X	X	Level 6 devices must have installed circuit breakers properly located in the FTD cockpit.	
3. Programming:								
a. The FTD must provide the proper effect of aerodynamic changes for the combinations of drag and thrust normally encountered in flight. This must include the effect of change in airplane attitude, thrust, drag, altitude, temperature, and configuration.		X	X		X	X	Levels 3 and 6 additionally require the effects of change in gross weight and center of gravity. Levels 2, 3, and 5 require only generic aerodynamic programming.	
b. The FTD must have the computer (analog or digital) capability (i.e., capacity, accuracy, resolution, and dynamic response) needed to meet the qualification level sought.		X	X	X	X	X		

Table 7.a. --- Requirement (6) is very restrictive, and cannot be done for night/dusk scenes.

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TABLE OF MINIMUM FLIGHT TRAINING DEVICE REQUIREMENTS INFORMATION—Continued

QPS Requirement	FTD level						Additional details	Notes
General FTD Standards	1	2	3	4	5	6		
a. The FTD may have a motion system; if desired, although it is not required.		X	X	X	X	X	If installed, the motion system operation may not be distracting. The motion system standards set out in QPS FAA-S-120-40C for at least Level A simulators is acceptable.	
7. Visual System:								
a. The FTD may have a visual system; if desired, although it is not required. If a visual system is installed, it must meet the following criteria: (1) Single channel, uncollimated display is acceptable (2) Minimum field of view: 18° vertical/ 24° horizontal for the pilot flying (3) Maximum parallax error: 10° per pilot (4) Scene content may not be distracting (5) Minimum distance from the pilot's eye position to the surface of a direct view display may not be less than the distance to any front panel instrument (6) Minimum resolution of 5 arc-min. for both computed and displayed pixel size (7) Maximum latency or through-put must not exceed 300 milliseconds		X	X	X	X	X	A statement of capability is required. A demonstration of latency or through-put is required. Visual system standards set out in QPS FAA-S-120-40C, for at least Level A simulators is acceptable. However, if additional authorizations (training, testing, or checking credits) are sought that require the use of a visual system, these standards apply.	
8. Sound System:								
a. The FTD must simulate significant cockpit sounds resulting from pilot actions that correspond to those heard in the airplane.			X			X		

Para 1.a.(1) --- “..... Test data described in 60.13, and paragraph 9 of this attachment” Should read as “.... Test data described in 60.13, and paragraph 9 in the main body of this appendix”

Para 1.a.(3) --- “ ... included in this appendix ...” should read as “.... included in this attachment...”

Attachment 2 to Appendix B to Part 60—
Flight Training Device (FTD) Objective Tests

1. General

Begin QPS Requirements

a. Test Requirements

(1) The ground and flight tests required for qualification are listed in the following Table of Objective Tests. Computer generated FTD test results must be provided for each test. If a flight condition or operating condition is required for the test but which does not apply to the airplane being simulated or to the qualification level sought, it may be disregarded (for example: an engine out missed approach for a single-engine airplane; a maneuver using reverse thrust for an airplane without reverse thrust capability; etc.). Each test result is compared against Flight Test Data described in § 60.13, and Paragraph 9 of this attachment. (See paragraph 1.b. of this attachment for additional information.) Although use of a driver program designed to automatically accomplish the tests is authorized, each test must be able to be accomplished manually while recording all appropriate parameters. The results must be produced on a multi-channel recorder, line printer, or other appropriate recording device acceptable to the NSPM. Time histories are required unless otherwise indicated in the Table of Objective Tests. All results must be labeled using the tolerances and units given.

(2) The Table of Objective Tests in this attachment sets out the test results required, including the parameters, tolerances, and flight conditions for FTD validation. Tolerances are provided for the listed tests because aerodynamic modeling and acquisition/development of reference data are often inexact. All tolerances listed in the following tables are applied to FTD performance. When two tolerance values are given for a parameter, the less restrictive may be used unless otherwise indicated.

(3) Certain tests included in this appendix must be supported with a Statement of Compliance and Capability (SOC). In the following tabular listing of FTD tests, requirements for SOC's are indicated in the "Test Details" column.

(4) When operational or engineering judgment is used in making assessments for flight test data applications for FTD validity, such judgment must not be limited to a single parameter. For example, data that exhibit rapid variations of the measured parameters may require interpolations or a "best fit" data section. All relevant parameters related to a

given maneuver or flight condition must be provided to allow overall interpretation. When it is difficult or impossible to match FTD to airplane data throughout a time history, differences must be justified by providing a comparison of other related variables for the condition being assessed.

(5) It is not sufficient, nor is it acceptable, to program the FTD so that the aerodynamic modeling is correct only at the validation test points. Unless noted otherwise, tests must represent airplane performance and handling qualities at normal operating weights and centers of gravity (CG). If a test is supported by aircraft data at one extreme weight or CG, another test supported by aircraft data at mid-conditions or as close as possible to the other extreme is necessary. Certain tests that are relevant only at one extreme CG or weight condition need not be repeated at the other extreme. The results of the tests for Levels 3 and 6 are expected to be indicative of the device's performance and handling qualities throughout the following:

- (a) the airplane weight and CG envelope;
- (b) the operational envelope; and
- (c) varying atmospheric ambient and environmental conditions—including the extremes authorized for the respective airplane or set of airplanes.

(6) When comparing the parameters listed to those of the airplane, sufficient data must also be provided to verify the correct flight condition and airplane configuration changes. For example: to show that control force is within ± 5 pounds (2.2 daN) in a static stability test, data to show the correct airspeed, power, thrust or torque, airplane configuration, altitude, and other appropriate datum identification parameters must also be given. If comparing short period dynamics, normal acceleration may be used to establish a match to the airplane, but airspeed, altitude, control input, airplane configuration, and other appropriate data must also be given. If comparing landing gear change dynamics, pitch, airspeed, and altitude may be used to establish a match to the airplane, but landing gear position must also be provided. All airspeed values must be clearly annotated as to indicated, calibrated, etc., and like values used for comparison.

(7) The QTG provided by the sponsor must describe clearly and distinctly how the FTD will be set up and operated for each test. Overall integrated testing of the FTD must be accomplished to assure that the total FTD system meets the prescribed standards; i.e., it is not acceptable to test only each FTD subsystem independently. A manual test procedure with explicit and detailed steps for completion of each test must also be provided.

(8) In those cases where the objective test results authorize a "snapshot" result in lieu of a time-history result, the sponsor must ensure that a steady state condition exists from 5 seconds prior to, through 2 seconds after, the instant of time captured by the "snapshot."

(9) For previously qualified FTDs, the tests and tolerances of this appendix may be used in subsequent recurrent evaluations for any given test providing the sponsor has submitted a proposed MQTG revision to the NSPM and has received NSPM approval.

(10) FTDs are evaluated and qualified with an engine model simulating the airplane manufacturer's flight test engine. For qualification of alternate engine models (either variations of the flight test engines or other manufacturer's engines) additional FTD tests with the alternate engine models are required. Where thrust is different by more than 5% from the flight test engine, flight test data from an airplane equipped with the alternate engine is required. Where the airplane manufacturer certifies that the only impact on the FTD model is thrust, and that other variables related to the alternate engine (such as drag and thrust vector) are unchanged or are insignificantly changed, additional FTD tests may be run with the same initial conditions using the thrust from the flight test data as a driven parameter for the alternate engine model.

(11) Tests of handling qualities must include validation of augmentation devices. FTDs for highly augmented airplanes will be validated both in the unaugmented configuration (or failure state with the maximum permitted degradation in handling qualities) and the augmented configuration. Where various levels of handling qualities result from failure states, validation of the effect of the failure is necessary. Requirements for testing will be mutually agreed to between the sponsor and the NSPM on a case-by-case basis.

End QPS Requirements

b. Discussion

Begin Information

(1) If relevant winds are present in the objective data, the wind vector (magnitude and direction) should be clearly noted as part of the data presentation, expressed in conventional terminology, and related to the runway being used for the test.

End Information

TABLE OF OBJECTIVE TESTS

QPS requirement										Info notes
Test	Tolerance	Flight conditions	Flight training device level						Test details	
			1	2	3	4	5	6		
2. Performance										
a. Takeoff										

Table 2.c.(1) & (2) --- There is mismatch between Landing under Flight conditions and Rejected Takeoff requirement under Test details. Needs correction.

Table 2.d.(2) --- Under Test details: +/- 1% should be +/- 1.

Table 3. --- Under Note: "... of an alternative method during the initial ..." should read as "... of an alternative method. Repeat of the alternative method during the initial ..."

Table 3.a.(1)(b) --- This should be applicable to level 5.

Page 60389 Table 3.a.(2)(a) --- Tolerance: 27 deg should be 2 deg for spoiler.

TABLE OF OBJECTIVE TESTS—Continued										
QPS requirement										
Test	Tolerance	Flight conditions	Flight training device level						Test details	Info notes
			1	2	3	4	5	6		
(1) Ground Acceleration Time	±5% Time or ±1 Second	Ground/Takeoff			X			X	Record acceleration time for a minimum of 80% of the total segment from brake release to V _r . Preliminary aircraft certification data may be used.	
b. Climb										
(1) Normal Climb	±3 Kts Airspeed, ±5% or ±100 FPM (0.5 Meters/Sec) Climb Rate	All Engines Operating		X	X		X	X	Record results at nominal climb speed and at nominal altitude. Manufacturer's gross climb gradient may be used for flight test data. May be a snapshot test result.	
c. Ground Deceleration										
(1) Deceleration time, using manual application of wheel Brakes; no reverse thrust	±5% time or ±1 Second	Landing Dry Runway			X			X	Record time for at least 80% of the segment from initiation of the Rejected Takeoff to full stop.	
(2) Deceleration time, using reverse thrust and no wheel brakes	±5% time or ±1 Second	Landing Dry Runway			X			X	Record time for at least 80% of the segment from initiation of Rejected Takeoff to full stop.	
d. Engines										
(1) Acceleration	±10% time	Approach or Landing		X	X		X	X	Record engine power (N ₁ , N ₂ , EPR, Torque, etc.) from idle to go-around power for a rapid (slam) throttle movement. Tolerance of ±1 second authorized for Levels 2, 3, and 5.	
(2) Deceleration	±10% Time	Ground/Takeoff		X	X		X	X	Record engine power (N ₁ , N ₂ , EPR, Torque, etc.) from Max T/O power to 90% decay of Max T/O power for a rapid (slam) throttle movement. Tolerance of ±1% second authorized for Levels 2, 3, and 5.	
3. Handling Qualities										
Note: For FTDs requiring Static or Dynamic tests at the controls, special test fixtures will not be required during initial or upgrade evaluations if the sponsor's QTG/MQTG shows both test fixture results and the result of an alternative method during the initial or upgrade evaluation would then satisfy this test requirement. Contact the NSPM for clarification of any issue regarding airplanes with reversible controls.										
a. Static Control Checks										
(1)(a) Column Position vs. Force and Surface Position Calibration.	±2 lbs. (0.9daN) Breakout, ±5 lbs. (2.2 daN) or ±10% Force, ±2° Elevation.	Ground						X	Record results for an uninterrupted control sweep to the stops. (CCA: Position vs. force not required if cockpit controller is installed in the FTD.)	
(1)(b) Column Position vs. Force.	±2 lbs. (0.9daN) Breakout, ±5 lbs. (2.2 daN) or ±10% Force.	Ground		X	X				Record results for an uninterrupted control sweep to the stops. (CCA: Position vs. force not required if cockpit controller is installed in the FTD.)	

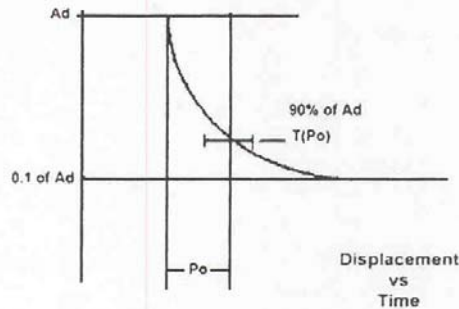
Table 3.b.(5) --- Tolerance: “+/- 2% net thrust or equivalent in cruise, +/- 5% net thrust or equivalent in approach and landing” should be “+/- 5% net thrust or equivalent”. This tolerance will be consistent with appendix A

Table 3.c.(3)(b) --- Do you really mean 20 sec under tolerance? AC 120-45A requires 30sec.

TABLE OF OBJECTIVE TESTS—Continued

QPS requirement										Info notes
Test	Tolerance	Flight conditions	Flight training device level						Test details	
			1	2	3	4	5	6		
(3) Gear Change Force	±5 lbs. (2.2 daN) or ±20% Force.	Takeoff and Approach		X	X		X	X	May be a series of snapshot test results. Gear change dynamics will be accepted. (CCA: Test in Normal and Non-normal control state).	
(4) Gear and Flap Operating Times.	±3 Seconds or ±10% of Time.	Takeoff and Approach		X	X		X	X		
(5) Longitudinal Trim	±1° Pitch Control (Stab and Elevator); ±1° Pitch Angle, ±2% Net Thrust or equivalent in Cruise; ±5% Net Thrust, or equivalent in Approach and Landing.	Cruise, Approach, Landing		X	X		X	X	May be a series of snapshot test results. Levels 2, 3, and 5 may use equivalent stick and trim controllers in lieu of stabilizer and elevator. (CCA: Test in Normal and Non-normal control state).	
(6) Longitudinal Maneuvering Stability (Stick Force/g).	±5 lbs. (2.2 daN) or ±10% Column Force or Equivalent Surface position.	Cruise, Approach, Landing						X	May be a series of snapshot test results. Force or surface deflection must be in the correct direction. (CCA: Test in Normal and Non-normal control state).	
(7) Longitudinal Static Stability.	±5 lbs. (2.2 daN) or ±10% Column Force or Equivalent Surface position.	Approach		X	X		X	X	May be a series of snapshot test results. Levels 2, 3, and 5 must exhibit positive static stability, but need not comply with the numerical tolerance. (CCA: Test Normal and Non-normal control state).	
(8) Stall Warning (actuation of stall warning device).	±3 Kts Airspeed, ±2° Bank	Second Segment Climb and Approach or Landing.		X	X		X	X		
(9)(a) Phugoid Dynamics ...	±10% of Period, ±10% of Time to 1/2 Amplitude or ±0.2 of Damping Ratio.	Cruise						X	Results must include whichever is less of the following: Three (3) full cycles (5 overshoots after the input is completed), or the number of cycles sufficient to determine time to 1/2 or double amplitude. (CCA: Test in Normal and Non-normal control state.).	
(9)(b) Phugoid Dynamics ...	±10% of Period with Representative Damping.	Cruise		X	X		X		CCA: Test in Normal and Non-normal control state.	
(10) Short Period Dynamics	±1.5° Pitch or ±2°/sec Pitch Rate, ±0.10g Normal Acceleration.	Cruise						X	CCA: Test in Normal and Non-normal control state.	
c. Lateral Directional										
(1) Roll Response	±10% or ±2°/sec Roll Rate	Cruise and Approach or Landing.		X	X		X	X		
(2) Response to Roll Controller Step Input.	±10% or ±2°/sec Roll Rate	Approach or Landing			X			X	CCA: Test in Normal and Non-normal control state.	
(3)(a) Spiral Stability	Correct Trend	Cruise		X			X		CCA: Test in Normal and Non-normal control state.	
(3)(b) Spiral Stability	Correct Trend, and ±3° of Bank Angle or ±10% at 20 sec.	Cruise			X			X	Data averaged from direction may be used. (CCA: Test in Normal and Non-normal control state.).	

Figure 2. --- “0.1 Ad” should be redrawn in line with “90% of Ad” location.



ATTACHMENT 2 TO APPENDIX B TO PART 60—

FIGURE 2. CRITICALLY-DAMPED STEP RESPONSE

BILLING CODE 4910-13-C

Begin Information

(3)(a) The following summarizes the tolerances, T , for an illustration of the referenced measurements (See Figures 1 and 2 of this attachment)

$T(P_0) \pm 10\%$ of P_0
 $T(P_1) \pm 20\%$ of P_1
 $T(A) \pm 10\%$ of A , $\pm 20\%$ of Subsequent Peaks
 $T(A_0) \pm 10\%$ of A_0 = Residual Band
 Overshoots ± 1

(b) In the event the number of cycles completed outside of the residual band, and thereby significant, exceeds the number depicted in figure 1 of this attachment, the following tolerances (T) will apply:
 $T(P_n) \pm 10\%(n+1)\%$ of P_n , where “ n ” is the next in sequence.

e. Alternative Method for Control Dynamics. (1) An alternative means for dealing with control dynamics applies to airplanes with hydraulically powered flight controls and artificial feel systems. Instead of free response measurements, the system would be validated by measurements of control force and rate of movement.

(2) For each axis of pitch, roll, and yaw, the control shall be forced to its maximum extreme position for the following distinct rates. These tests shall be conducted at typical taxi, takeoff, cruise, and landing conditions.

(a) Static Test—Slowly move the control such that approximately 100 seconds are required to achieve a full sweep. A full sweep is defined as movement of the controller from neutral to the stop, usually aft or right stop, then to the opposite stop, then to the neutral position.

(b) Slow Dynamic Test—Achieve a full sweep in approximately 10 seconds.

(c) Fast Dynamic Test—Achieve a full sweep in approximately 4 seconds.

Note: Dynamic sweeps may be limited to forces not exceeding 100 lb.

f. Tolerances.

(1) Static Test—Items 2.a.(1) (2) and (3) of this appendix.

(2) Dynamic Test—2 lb. or 10 percent on dynamic increment above static test.

g. The FAA is open to alternative means such as the one described above. Such alternatives, however, would have to be justified and found appropriate to the application. For example, the method described here may not apply to all manufacturers' systems and certainly not to airplanes with reversible control systems. Hence, each case must be considered on its own merit on an ad hoc basis. If the FAA finds that alternative methods do not result in satisfactory simulator performance, then more conventionally accepted methods must be used.

End Information

5. Alternative Objective Data for FTD Levels 2, 3, and 5

Begin QPS Requirements

a. This paragraph 5 (including the following tables) is relevant only to FTD Levels 2, 3, and 5 and is provided due to the fact that these levels are required to perform and handle similarly to a set of airplanes having similar performance (normal airspeed/altitude operating envelope), that have similar handling characteristics, and have the same number and type of propulsion systems (engines).

b. The following tables reflect the performance range typical for the stated set of airplanes and may be used without having to acquire flight test data or gather validation data from any other source. However, if the performance of the device does not fall within the established range (according to the following tables) for a specific table entry, and the sponsor has airplane flight test data, acceptable to the NSPM, that matches the performance of the device within the tolerances established in the Table of Objective Tests, this flight test data may be used for that specific table entry requirement. The reader is reminded that Level 3 devices require testing in more areas than Level 2 and Level 5 devices. Therefore, as the following tables contain information for all three FTD levels, some of the data in these tables may not be pertinent to a Level 2 or Level 5 FTD.

c. The following applies to those wishing to pursue this alternative approach:

(1) The sponsor will submit a complete QTG including the following:

(a) If this alternate source of data method is used, recordings that demonstrate that the performance of the FTD is within the allowable performance range.

(b) Results from the objective tests appropriate to the level of qualification sought.

(2) The QTG test results must include all appropriate parameters for which tolerances are established in the Table of Objective Tests, and must include all relevant information concerning the conditions under which the test was conducted; e.g., gross weight, center of gravity, airspeed, power setting, altitude (climbing, descending, or level), temperature, configuration, and any other parameter that would have an impact on the conduct of the test.

(3) One reviewed and accepted by the NSPM, these test results are the validation